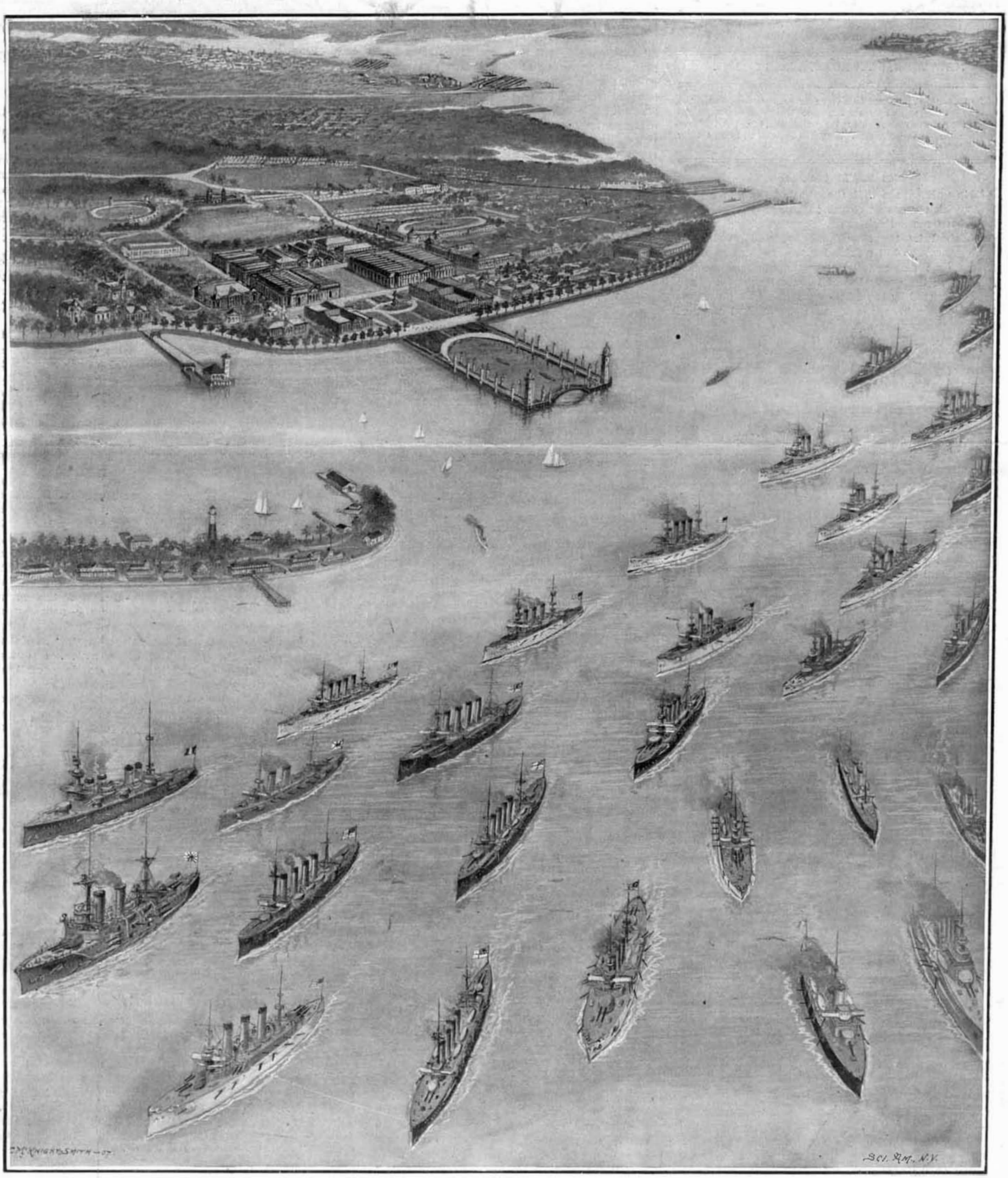
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1907, by Munn & Co.]

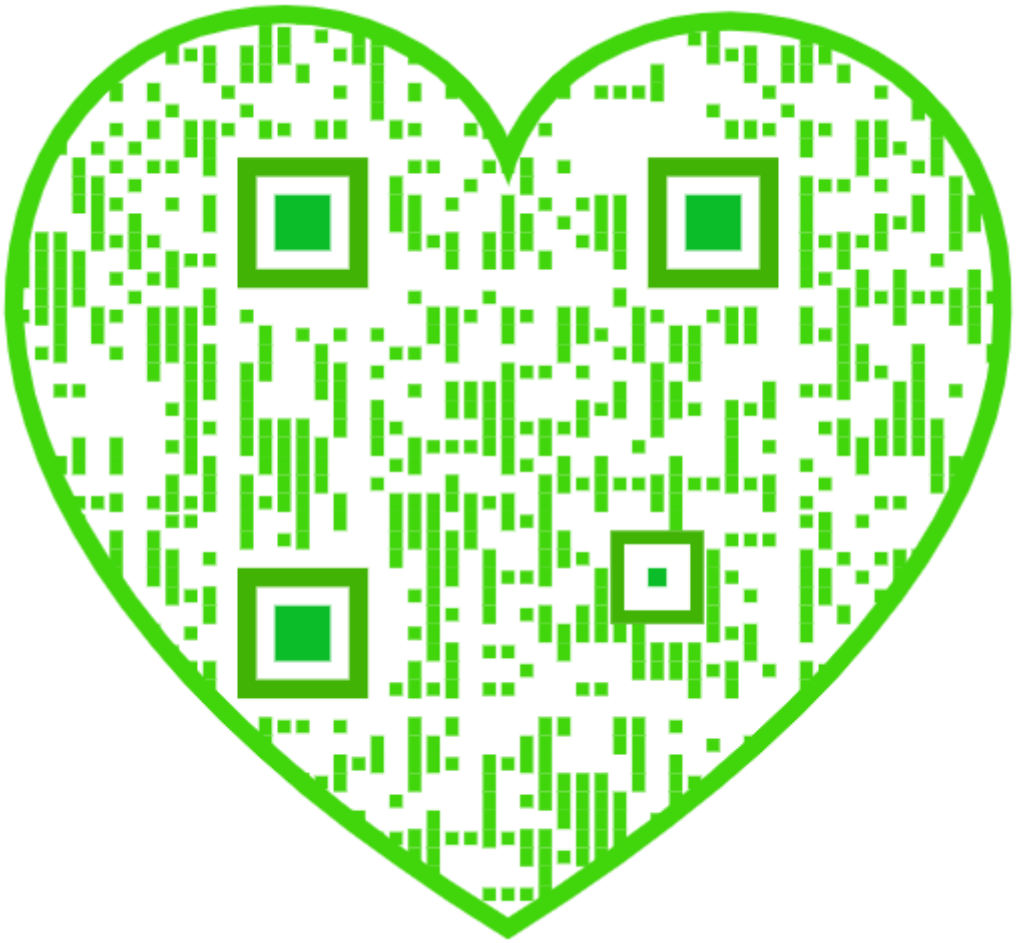
Vol. XCVI.—No. 17.
ESTABLISHED 1845.

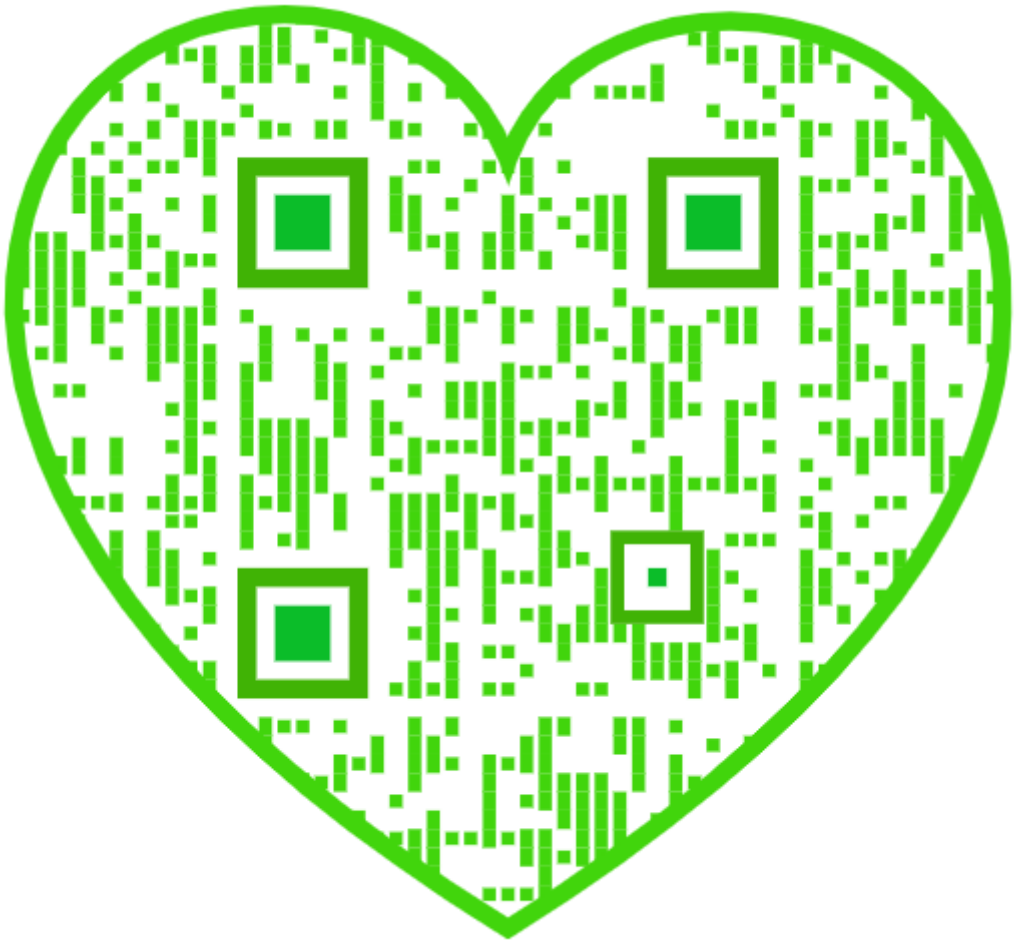
NEW YORK, APRIL 27, 1907.

[10 CENTS A COPY
$3.00 A YEAR.



THE NAVAL REVIEW AND EXPOSITION GROUNDS AT JAMESTOWN.—[See page 350.]





SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year, for the United States or Mexico.....$3.00
One copy, one year, for Canada..... 3.75
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845) .....$3.00 a year
Scientific American Supplement (Established 1876)..... 5.00 "
American Homes and Gardens..... 3.00 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, APRIL 27, 1907.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE PEACE CONGRESS.

It is unfortunate that the aims of the Peace Congress which recently closed in this city should not have been more intelligently appreciated and clearly emphasized by the New York press. It is always more difficult to kill a false impression than to create a true one; and unfortunately the later movements directed to the promotion of international peace have been hampered by the misapprehension that peace was being sought by the altogether impractical road of immediate disarmament.

As a matter of fact, the aims of the recent Congress were purely educational—the inculcation and development of an idea. No one realized better than the sponsors of the congress that all those mighty changes in sentiment and practice which because of their magnitude are known as the revolutions of history, are of slow growth, and require, from the time of the sowing of the first seed to the final harvesting of results, a period which is frequently measured by centuries.

War, with everything that the term involves, political, diplomatic, material, and sentimental, is one of the most stupendous facts of national and international life. The forms and instrumentalities of war, both material and human, and all its vast organizations and varied interests, are so interwoven with the national life, that the abolition of war by the immediate disbanding of fleets and armies would be altogether impracticable.

The reign of international peace can be brought about only through a campaign of education similar to that inaugurated by the Peace Congress, which has just closed its labors. Regret it as we may, it is a fact that the average citizen does not realize that war is savagery; that when the citizens of two modern nations set out deliberately to butcher each other, they are simply reverting to that age in the development of the race, when man was emerging from the brute into the human. The world must be made to understand that war is the greatest anachronism of the day. When these facts have been clearly settled in people's minds, and their significance appreciated, a great step will have been taken toward the final abolition of war.

Of the many suggestions advanced at the congress, the most practical, the one which if adopted would produce the most immediate results, was that set forth by Secretary of State Root, in the course of his very able address. After stating that the great obstacle to the universal adoption of arbitration is not the unwillingness of civilized nations to submit to the decision of an impartial tribunal, but rather an apprehension that the tribunal selected might not be impartial, Mr. Root went on to state that what is needed is "the substitution of judicial action for diplomatic action, the substitution of judicial sense of responsibility for diplomatic sense of responsibility. We need for arbitration," said the Secretary of State, "judges who will be interested only in the question appearing on the record before them. Plainly this end is to be attained by the establishment of a court of permanent judges, who will have no other occupation and no other interests but the exercise of the judicial faculty under the sanction of that high sense of responsibility."

Of the success of the Peace Congress there can be no two opinions. Seldom, if ever, has a more representative and distinguished body of men gathered for deliberations of such international importance. In addition to the fact that men pre-eminent in every important sphere of human activity were present from all corners of the earth, the congress received the highest national and local recognition; as witness the fact that the President sent a personal letter and was represented by the Secretary of State and that the mayor of the city and governor of the State in which the congress gathered were also among its principal speakers.

SCOPE AND PURPOSE OF THE JAMESTOWN EXPOSITION.

The traveler who may be ascending the sluggish waters of the James River, in search of the wealth of historic associations with which its banks abound, after he has covered some thirty miles of his journey, and unless some timely informant be at hand, will be apt to overlook a stretch of shore which, scarcely lifting its uninteresting level above the waters of the river, has little to break its monotony beyond an irregular clump of trees, scarce hidden within which he will, on closer inspection, should his curiosity be so far aroused, discern the dark red and green walls of an old ivy-covered tower. Desolate, remote, and largely sedge-covered, this little island affords the passing traveler virtually no suggestion that it holds all that is left of the crumbling walls and scattered graves of the town and people of Jamestown—the first colonial settlement in America. It needs a creative imagination to realize that here was witnessed the "beginnings of a nation," which to-day, after the lapse of three brief centuries, numbers eighty millions of people, and believes, not without cause, that it is destined to become, at least in material resources and material power, the leading people of the earth.

The sponsors of the Jamestown Exposition are to be congratulated on the judgment and good taste with which they have determined the scope and characteristics of the enterprise. With the memories of the colossal Louisiana Purchase Exposition at St. Louis fresh in the minds of the people, it would have been folly to attempt to rival that over-big affair in the size of its buildings and the number of its exhibits. Magnificent though it was, the St. Louis Fair was big to the point of burdensomeness and boredom. It was a *reductio ad absurdum* of the cult of the superlative; and it taught the valuable lesson that future expositions should aim to be intensive rather than interminable, distinctive rather than discursive.

The Jamestown Exposition will be both intensive and distinctive. It aims at historical and educational results; the one being secured largely by the character of the buildings, the other by a careful selection of the exhibits which they will house. In searching for a fitting means to embody those spectacular effects which have come to be regarded as an essential, and by many people, alas! as the most desirable, feature of a great exposition, the management have availed themselves of the fine opportunity presented by the waters of Hampton Roads, and have arranged for an international display of the naval forces of the world, which, if it does not rival in extent, will possibly exceed in interest, any previous pageant of the kind.

The Jamestown Exposition is essentially a display of the peaceful arts; hence, it is peculiarly fitting that its most imposing feature should consist of a gathering of battleships and cruisers—those stately patrolmen of the high seas, whose day-by-day duty it is to preserve the peace of the world and render the ocean highways secure; whose activities are mainly concerned in the promotion of international peace; and whose pacific purpose is never so clearly manifested as in an international review of the kind now being organized at the mouth of the James River.

RAISING THE ASSOUAN DAM.

The Egyptian government, as a result of prolonged deliberations, has now finally decided to raise the height of the water of the River Nile impounded behind the Assouan barrage to 22 feet above its present maximum level. This project was first mooted shortly after the works were completed and opened, and the plans and calculations were prepared by the Irrigation Department as far back as 1904, and submitted to Sir Benjamin Baker, the consulting engineer, for his consideration and approval in the fall of that year. About this time, however, no little sensation was created in scientific and engineering circles by the paper published by two professors of the London University, Atcherley and Carl Pearson, regarding the theory and stability of dams, in which reference was made to those thrown across the Nile at Assouan and Asyut. As a result of this discussion, the Egyptian government invited Sir Benjamin Baker to visit the works and announce his decision regarding the advisability of raising the level of the works, as proposed in the plans drawn up by the Irrigation Department. Sir Benjamin Baker spent several weeks inspecting both the barrages and the protective apron which had been built below the toe of the dam, to prevent the friable rock of the river bed being scoured away by the force of the water escaping through the sluices. Upon the completion of his surveys he expressed the opinion: (1) That the dam was perfectly safe and sound throughout, and that there was no reason whatever for the slightest anxiety regarding its stability. (2) That extensive works should be carried out on the talus downstream of the dam. (3) That no decision could be given by him regarding the advisability of raising the dam for at least two years, at the expiration of which time it was hoped that the protective works would have been completed and tested.

In the early part of this year Sir Benjamin Baker visited the barrages and made a prolonged and detailed investigation of the protective works, the greater part of which had been completed, and was able to inspect the behavior of that section of the operations which had been first completed and submitted to practical test for several months. They were found to be perfectly satisfactory, and the increase in the height of the barrages was thereupon approved.

During the interval that has elapsed between the completion of the plans for this work in 1904 and the recent decision, elaborate surveys and exhaustive examinations have been carried out by the Irrigation Department throughout the Nile Valley between Wady Halfa and Khartoum, to ascertain the practicability of throwing a barrage across the river at a suitable point above the Assouan dam, and thereby creating a subsidiary reservoir, as an alternative to raising the height of the Assouan dam. It was found that no such dam could be built.

The raising of the barrage will be a work of only less importance than the erection of the structure itself, while the advantages reaped by the barren lands of the Nile Valley will equal those conferred by the original dam. The additional quantity of water that will thus be impounded by raising the level 22 feet will be two and a quarter times greater than that stored by the existing barrage. By this new supply it will be possible to bring about a million acres of land under irrigation. At the present moment there are approximately 950,000 acres of government land in the northern tracts of the Nile Valley lying untilled because of the dearth of water. It is intended to reclaim the whole of this tract by using the additional water that will be impounded in the enlarged reservoir. The wealth and revenue of the country will be immediately and greatly increased. In the cotton crop alone the increase, due to the additional water supply, will represent, it is estimated, a sum of between $17,500,000 and $20,000,000. The undertaking is to be commenced at an early date, and the total cost of completing the work will approximate $7,500,000, which outlay will include the compensation to be awarded to the inhabitants of Numidia whose land will be submerged. The work will take some six years to complete, so that the country will not reap the full benefit accruing from this huge increase in the water supply for irrigation purposes until the year 1914.

Unfortunately, the raising of the water level will entail the still further submergence of the temples of Philæ and other Nubian archeological monuments, upon the protection of which, by elaborate underpinning, a vast sum of money was expended when the existing structure was thrown across the river. Although the government deplores the necessity of partly submerging these historic remains, it is realized that the economic and agricultural demands of the country must receive first consideration. However, the authorities pledge themselves to do everything possible to minimize the injury. An archeological survey, extending from Wady Halfa to Assouan, has been made by the order of the government, and the various archeological societies have been invited to co-operate with the authorities in their task of preserving the remains as far as the exigencies of the country will permit.

AN OPPRESSIVE POSTAL REGULATION.

On April 17 the publishers of the United States received notification from Washington that the Canadian postal authorities had made new regulations affecting the rate on newspapers and periodicals, whereby the postage to Canada was increased nearly six times. This law is to go into effect on May 8, 1907. The publishers in this country are powerless to protect themselves in view of this arbitrary act. It would not be honorable or fair to terminate or curtail subscriptions which have been sent in good faith up to the present time. The result is that the publishers are obliged to pay this considerable increase in postal rates without compensation from subscribers. This is a heavy and unjust burden, which could have been avoided by giving due and reasonable notice of such contemplated change of rate. This act has been done in the most arbitrary and unnecessarily abrupt manner, and it is hoped that when the great injustice to American publishers is understood at Ottawa, and the unnecessary harshness of the provisions of the act, the matter will be reconsidered, and some measures taken to defer the enforcement of the new rate until the end of the year.

While this rule is a matter of such considerable financial loss to American publishers, in the end it is sure to be most severely felt by the Canadian reading public. By far the largest percentage of periodical literature is in the widest sense educational. To increase the cost of such literature to the reading

masses is unwise, impolitic, and sure to arouse the antagonism of those whom the increase affects.

Of course, it will be absolutely essential for publishers to increase the price of their periodicals mailed to Canada on all new business, but as eighty per cent of subscriptions are contracted for during the months of November, December, and January, the injustice done the publishers is apparent, owing to the season at which the change in rates becomes effective.

The publishers are forced to bear the burden of the increased rate without compensation, and this loss will in the aggregate amount to hundreds of thousands of dollars. As a matter of fact, the financial loss to the publishers of this paper arising out of the change in rates will be between two and three thousand dollars.

RULES GOVERNING THE COMPETITION FOR THE SCIENTIFIC AMERICAN FLYING MACHINE TROPHY.

A special committee of the Aero Club of America, appointed for the purpose, has formulated the following provisional rules governing the competition for flying machines of the heavier-than-air type, which will be inaugurated at the Jamestown Exposition on September 14 next.

It is the intention of the SCIENTIFIC AMERICAN, in offering this trophy, to have it always open to competition by inventors the world over. Should the trophy be won by the representative of a foreign aeronautical club, this club, if a member of the Federation Aeronautique Internationale, may become the custodian of the trophy; but the future competitions, even if held abroad, shall be carried out under the same rules and conditions used by the Aero Club of America in the competitions held here.

RULES GOVERNING THE COMPETITION FOR THE SCIENTIFIC AMERICAN AERONAUTICAL TROPHY.

1. This competition will be held annually, and the conditions of the trials will be progressive in character, so as to keep abreast of the state of the art. The first contest will be held at the Jamestown Exposition on September 14, 1907, and all entries for this contest must be made in writing and sent to the secretary of the Aero Club of America, 12 East 42d Street, New York city, prior to September 1, 1907. The rules governing future contests will be formulated by the contest committee of the Aero Club of America in accordance with the results obtained and the lessons learned in this first contest.

2. All heavier-than-air machines of any type whatever (aeroplanes, helicopters, orthopters, etc.), shall be entitled to compete for the trophy; but all machines carrying a balloon or gas-containing envelope for purposes of support are excluded from the competition.

3. The machine which accomplishes the required flight in the shortest time and with the best display of stability and ease of control, shall be declared the winner. If several machines perform equally well, the committee shall have the right to demand further flights in order to determine which is the best. If no machine makes the required flight on the date set for the contest, the one that subsequently first accomplishes such flight shall be declared the winner, and shall not be entitled to make a further flight until the next year, under the changed conditions of the contest.

4. The flights shall be made in calm air, if possible. If a wind of over 20 miles an hour is blowing, no trial need be made. Aeroplanes may start by running along on wheels on the ground under their own power, but no special track or launching device will be permitted. A smooth, level roadway, or a reasonably smooth, turfed field will be provided from which to make the start. Machines need not fly more than a few feet above the ground, or higher than is necessary to avoid obstacles. They should be capable of being steered both horizontally and vertically, and of alighting without being damaged. If there is a wind blowing, the flights shall be made in such direction as best suits each operator. The start should preferably be made against the wind.

5. The committee shall make arrangements to accurately time and measure all flights, as well as the distance traversed and time taken in starting and stopping. Accurate observations of the speed of the wind and other weather conditions at the time of the flight shall also be made and recorded by the committee. Complete specifications of the competing machines, giving weight, supporting surface, details of motors and propellers, etc., together with a description of any performance that the machine has made, shall be forwarded to the contest committee with the entry or when application is made for a trial.

6. Anyone desirous of making a flight at any subsequent time can arrange for such a test by communicating with the contest committee of the Aero Club of America, at least fourteen days in advance, and asking this committee to appoint a suitable time and place for the trial. If the committee believe the machine to be impractical, it can require the inventor either to prove the incorrectness of such belief by an informal demonstration with the machine itself, or by demonstration in some other satisfactory way which will show that the machine is operative.

7. The first flight shall be for a distance of one kilometer (3,280 feet) in a straight line.

8. After every competition, the name of the winner will be inscribed upon the trophy. If it is won three times in different years by any competitor, the trophy will then become his personal property.

Aeronautical Competitions, Jamestown Exposition, Norfolk, Va., April 28 to November 30.

No. 1. Special race limited to members representing recognized aero clubs for club championship, May 4.

No. 2. Dirigible balloon competition, June 1.

No. 3. Competition of balloons for distance, June 15.

No. 4. Competition of balloons for duration, August 3.

No. 5. Competition of balloons for objective point, September 7.

No. 6. Competition of balloons for altitude, November 16.

No. 7. Competition of balloons in pursuit of pilot balloon, August 17.

No. 8. Competition of carrier pigeons; flight from aeronautical concourse, exposition grounds, May 18.

No. 9. Simultaneous release of large number of small balloons carrying messages, May 18.

No. 10. Flying devices heavier than air, with motor and operator, September 14.

No. 11. Flying machine models with motor, August 24.

No. 12. Flying machine models without motor, and carrying operator, September 14.

No. 13. Kites for altitudes, November 2.

No. 14. Kites for steepest angle of flight, November 9.

No. 15. Kites carrying operators, November 16.

No. 16. Registering balloons, July 13.

No. 17. Competition of balloons and automobiles. (Date to be coincident with the arrival of the automobile tour.)

No. 18. Competition of dirigible balloons and automobiles, May 25.

No. 19. Competitions of photographs taken from balloons or kites.

No. 20. Competition of photographs taken of balloons, aeroplanes or other aeronautical objects.

No. 21. Competition of photographs of meteorological phenomena. (Exhibits for Nos. 19, 20, and 21 to be ready April 26, and continuing on exhibition throughout the exposition.)

No. 22. Signaling competitions with balloons or kites, October 12.

No. 23. Hot air balloon competition, October 5.

No. 24. Dropping (harmless) shells nearest selected objective point or target.

No. 25. Competition for longest trip, open during exposition.

New Means of Producing Ballast for Balloons.

A new method of producing ballast during a balloon trip has recently been tried in Berlin. In a balloon ascent just made by Capt. Von Krogh, the pilot of the Parseval balloon, a quantity of chemicals were carried, which have the property of absorbing moisture, and thus increasing their weight in a damp atmosphere. The experiments took place under the superintendence of Dr. Knochs of the Meteorological Institute, and as far as can be gathered at present, were of a successful nature. The ascent was made in the spherical balloon "Betzold" from Tegel (Berlin). After reaching a height of 5,904 feet a landing was effected at Ratteick near Koslin, 186 miles distant. Time taken was about six hours.

The Building of the United Engineering Society.

The dedicatory exercises of the new building of the United Engineering Society, at 25 West Thirty-ninth Street, New York city, to which Andrew Carnegie gave $1,500,000 for construction and still more when it came to raising an endowment fund, were held on April 17, 1907. The exercises were in the assembly hall of the new building, which is one of the finest auditoriums of its kind in the city.

Mr. Carnegie shared attention with the venerable Dr. Edward Everett Hale, President Arthur T. Hadley, of Yale, Ambassador Creel, of Mexico; Sir William H. Preece, president of the Institute of Electrical Engineers of England, and John Fritz, of the building committee, who received the most prolonged applause of any of those present.

Charles Wallace Hunt, who presided, had as a gavel the setting maul which Mrs. Carnegie used when she laid the cornerstone of the building. T. C. Martin, president of the Engineers' Club, read this telegram of congratulation from President Roosevelt:

The White House, Washington,
April 13, 1907.

My Dear Sir: I heartily congratulate you on the opening of the building of the Engineering Societies. The building will be the largest engineering center of its kind in the world. It is, indeed, the first of its kind, and its erection in New York serves to mark and emphasize the supremacy which this country is steadily achieving through her proficiency in applied science. The whole country is interested in the erection of such a building, and particularly, of course, all of those who follow either the profession of engineering or any kindred profession, and in no branch of work have Americans shown to greater advantage what we like to think of as the typically American characteristics.

With all good wishes, believe me, sincerely yours,

THEODORE ROOSEVELT.

Mr. T. C. Martin, 114 Liberty Street.

President Hadley delivered the principal address and declared that a combination of ethical and technical standards would produce the best professional service.

Ambassador Creel voiced the greeting of President Diaz of Mexico, and a letter was read from Charles A. Haswell, who, at the age of 97, is the dean of New York's community of engineers. Just before Mr. Carnegie was introduced, Charles F. Scott, the chairman of the building committee, delivered an historical address.

When Mr. Carnegie rose to speak, he asked the audience not to applaud him too long, lest he should conclude that they did not want to hear him.

"It is the spirit of the men that does the work," said Mr. Carnegie; "the safety of human society lies just here. Whenever we coalesce to do some good, a unification takes place and a consolidation; and whenever men meet to conspire against the public good—to do some evil—they find themselves unable to trust each other. That's why you needn't lie awake nights and worry about the future and about what problems society is going to meet. As sure as the sunflower turns toward the sun so the human race turns toward better things.

"This is the rock on which I rest, and on which I meditate sometimes. Nor can you deny this, that, quite apart from whatever evil exists, there is that principle of improvement inherent in us. To-day is better than yesterday and to-morrow will be better than to-day. So I look forward to the future of this building and I know that the organizations to whom it is devoted will advance and continue to meet the developing needs of our age."

Peary's Proposed Arctic Trip.

Commander Robert E. Peary has definitely decided to make another attempt to reach the North Pole. He stated that he would sail from New York as near July 1 next as possible. Sufficient money had been raised, he said, for repairing his ship, the "Roosevelt," and a fund of $100,000 necessary to equip the expedition would be available before July 1.

Commander Peary said that he expected to arrive among the ice fields by the middle of July. His equipment and crew, he said, would be practically the same as on his recently completed expedition. He will buy two hundred dogs when he arrives in Greenland. He expects that the trip may be made in about the same length of time as the 1905 trip, which required sixteen months.

The Current Supplement.

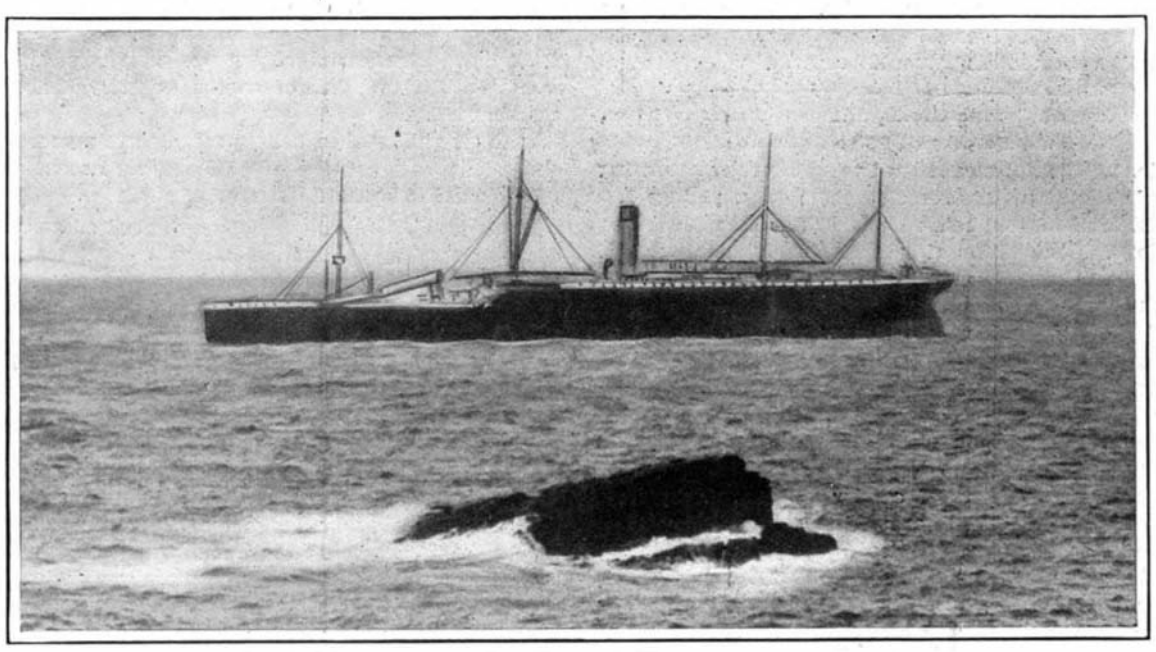
In the current SUPPLEMENT, No. 1634, the article on "How Coke is Made," begun in the last number, is concluded. Charles S. Walden writes on multiplex telephony. Some highly interesting experiments on the behavior of thin aluminium sheets in electrostatic fields are recorded. Prof. H. Geitel, well known for his splendid work in radioactivity, contributes an authoritative article on radioactivity and atmospheric electricity, which may safely be accepted as the latest utterance on the subject. An exceedingly interesting piece of physical apparatus, and one that any amateur can make and use, provided he has a little knowledge of electricity and a source of direct current at his command, is the speaking arc. In the current SUPPLEMENT Mr. A. Frederick Collins describes very explicitly how such an arc can be made at home. Prof. C. E. Lucke and S. N. Woodward have for months past been conducting an elaborate investigation for the purpose of ascertaining the comparative efficiencies of alcohol and gasoline in farm engines. The results of their investigations are published in the current SUPPLEMENT. G. K. Gilbert's most interesting monograph on the rate of recession of Niagara Falls is concluded. Sanford E. Thompson, a well-known authority on concrete, writes exhaustively on forms for concrete construction.

Ira Remsen Chosen President of National Academy of Sciences.

The National Academy of Sciences has elected Prof. Ira Remsen, of Johns Hopkins University, president, vice Prof. Alexander Agassiz, who retires after five years' service. The vacancy in the vice-presidency caused by the promotion of Prof. Remsen was filled by the election of Charles D. Walcott, secretary of the Smithsonian Institution.

SAVING A SHIP BY AMPUTATION.

It is not an uncommon occurrence for human life to be saved by amputation; but it is safe to say that the recent salvage of the White Star liner "Suevic," herewith illustrated, is the first instance in which this surgical operation was used in saving a ship. There is this important difference, however, that whereas the dismembered portion of the human body can be replaced by what is at best but a doubtful counterfeit, the portion of the White Star ship that was left behind on the rocks of the Scilly Islands, which in this case happened to be her head, will, in the course of a few months under the skillful hands of Harland & Wolff, be so perfectly reproduced and joined to the original ship, that no one will be able to tell, by looking at her, that such a drastic work of naval surgery was ever done on her.



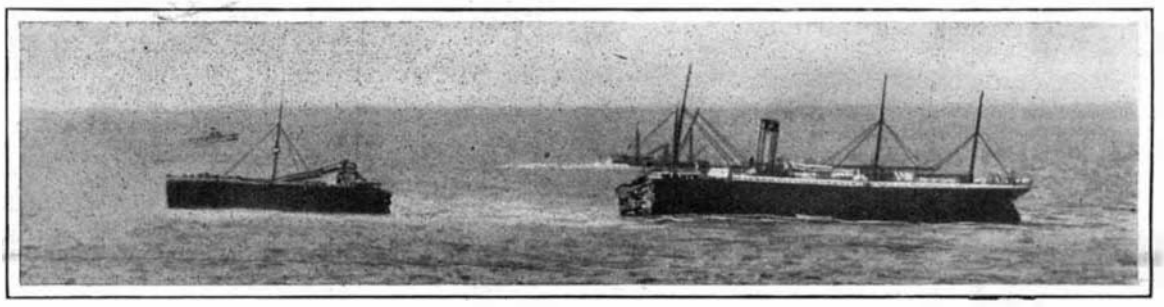
The "Suevic" Immediately After She Had Been Cut in Two.

On the evening of Sunday, March 17, the good ship "Suevic," 12,500 tons register, flying the flag of the White Star Company, was approaching the Scilly Islands at the close of a day in which she had been bowling along before a full southwesterly gale. The weather was thick, but the captain was sure of his reckoning, and confident that he had yet a few miles to go before reaching the vicinity of those greatly-dreaded rocks. Just as he was about to heave the lead, however, the "Suevic" ran full speed upon a ledge known as Maentare Rock, which lies immediately below the lofty point which is crowned by the lighthouse.

The "Suevic" is a big ship and weighty, measuring 550 feet in length by 63 feet in beam and 40 feet in molded depth. Her dead weight when she struck was probably about 20,000 tons. Consequently, before her momentum was arrested, she had driven about one-third of her whole length firmly upon the rocks. Very quickly, her three foremost holds filled with water; but, fortunately, the bulkheads of the after two-thirds of the ship held; and, by means of the ship's boats, and other craft which put out from shore, all of the passengers were safely landed.

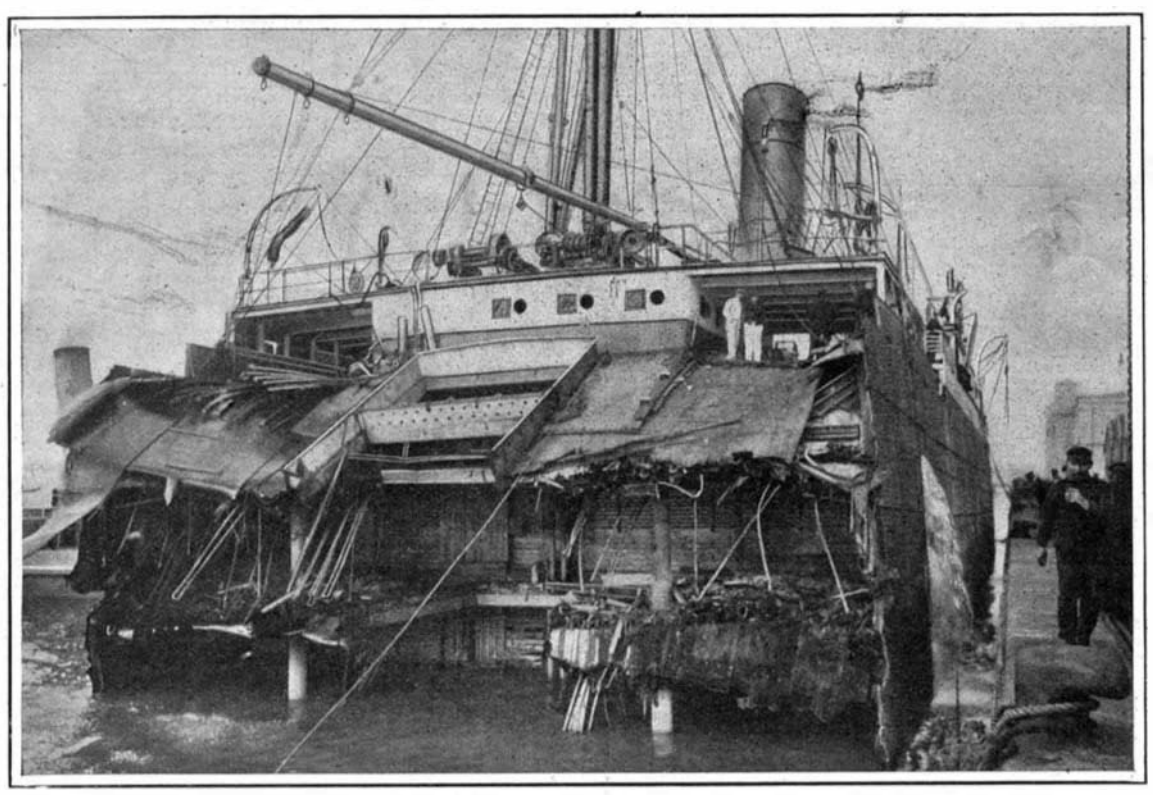
Immediately on learning of the disaster, the White Star Company rushed down to the Scilly Islands from Liverpool a strong force of engineers, divers, tugs, and a wrecking outfit; but the joint efforts of the tugs and the ship's own engines failed to budge her. Then it was that a consultation of the doctors was held, in which it was decided that nothing short of severing the head from the body could save the ship; and the operation was carried out as follows:

First, a stout bulkhead of heavy timbers was built transversely across the hull of the ship, back of the last point of rupture by the underlying rocks. While this was being done, the greater part of the cargo in the after portion of the ship was discharged, only 2,000 tons being left on board to keep the vessel in trim. Then, at the point of amputation, the wooden decks were cut through, exposing the steel decks underneath. A continuous line of dynamite cartridges was laid across each deck and carried entirely around the hull of the vessel. Electric wires were led to a distant point, and, when all was ready, the lines of cartridges were detonated. The intense local action of the dynamite was sufficient to cut cleanly through the whole of the plated structure of the ship, and immediately the after two-thirds of the vessel floated away intact, leaving the other third hung upon the rocks in the position shown in one of the accompanying illustrations. Several tugs then made fast to the floating portion of the vessel; the ship's engines, which were in perfect order, were started in the reverse direction; and the "Suevic," or rather 66 2/3 per cent of her, commenced the journey to the hospital in Southampton. It was a curious procession; and certainly, if it be true, as the poets would have us believe, that a ship is a thing of life, the "Suevic" must have been filled with amazement at her strange going.



The "Suevic" Backing Away from Her Bow.

The "Suevic" Starting Under Tow for Southampton, Leaving Her Bow on the Rocks.



After Arrival at Southampton. View Showing the Jagged Edges Where the Dynamite Cartridges Cut Through the Hull and Decks.

SAVING A SHIP BY AMPUTATION.

Liquid Carbonic Anhydride as a Solvent.

In all chemical literature there is but little information at hand as to the solubility of various solids in liquid carbon dioxide. According to reports and statements quoted in the Zeitschrift für Physikalische Chemie and in the Chemiker Zeitung (Repertory), C. H. Büchner has now, on the basis of experiments, supplied this lacking information. According to these experiments, inorganic substances, particularly carbonates, such as $CaCO_3$, Na_2CO_3, and the halogen salts, are insoluble in liquid carbon dioxide. Boracic acid, PCl_5, $AsBr_3$, J, P, Br, are slightly soluble; organic substances, as benzol, are mixable under all conditions. Naphthalin is at most soluble in carbon dioxide to but 1½ per cent. Between —60 deg. C. and +200 deg. C. ethyl alcohol showed no decomposition in carbon dioxide. Of the acids, succinic acid and phthalic acid were insoluble. Of the ethers, ethyl ether is under all conditions soluble. Fixed or but slightly volatile substances are in general insoluble. The author remarks that liquid carbon dioxide is sharply differentiated from other condensed gases such as sulphurous acid and ammonia, which easily resolve inorganic salts, and from the chlorides, bromides, iodides, and sulphides of hydrogen, in which many organic bodies are soluble.

Another Fiala Polar Trip.

Anthony Fiala, who headed the Baldwin-Ziegler expedition in search of the North Pole, has decided to fit out an expedition of his own, and is already beginning to equip it at a cost of $200,000. The commander and navigator George Comer, of East Haddam, who has acted as master of numerous whaling vessels that have made successful trips to northern waters, is now superintending the fitting out of the "Gifford" for the trip. As a preliminary to the expedition, Mr. Fiala purposes personally to conduct a party of Americans next June to within the Arctic Circle, and probably land on the coast of Greenland. This excursion will establish a base of supplies for the expedition proper, which, it is expected, will be in readiness for the following summer.

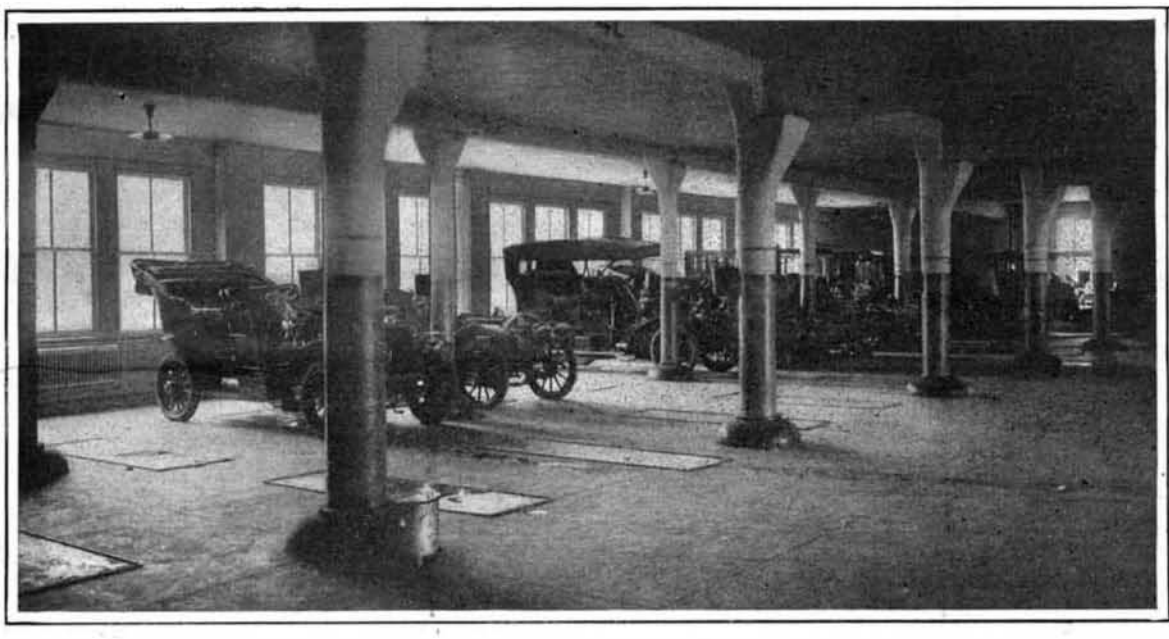
It has been decided to increase the distance and reduce the area of the target for the firing tests in the British navy with the 6-inch and 9.2-inch and 12-inch guns. The abnormally high scores made last year are responsible for the change, the opinion being held that the gunlayers can do well with a much smaller target at a longer range.

THE NEW HOME OF THE AUTOMOBILE CLUB OF AMERICA.

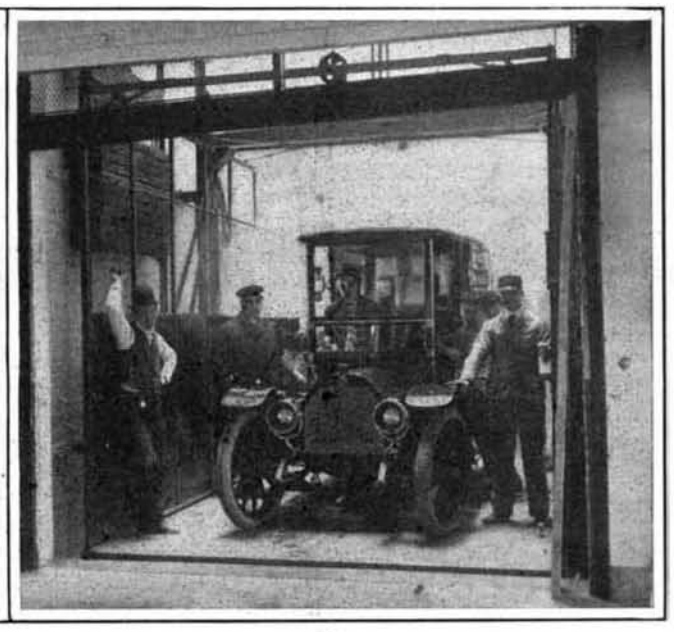
BY HARRY W. PERRY.

Formal opening of the new $500,000 club house of the Automobile Club of America was held April 18, when the final work of interior finishing and furnishing of the magnificent structure had just been completed. This new club house is of interest, not alone because it is the largest and most costly building in the world especially designed and constructed for use by an automobile club, but because it combines in an ingenious way the club quarters of a wealthy semi-social organization with garage and storage accommodations for three hundred motor cars owned by the members. Still another claim to interest is the fact that it is one of the first large structures erected in New York by the reinforced concrete process.

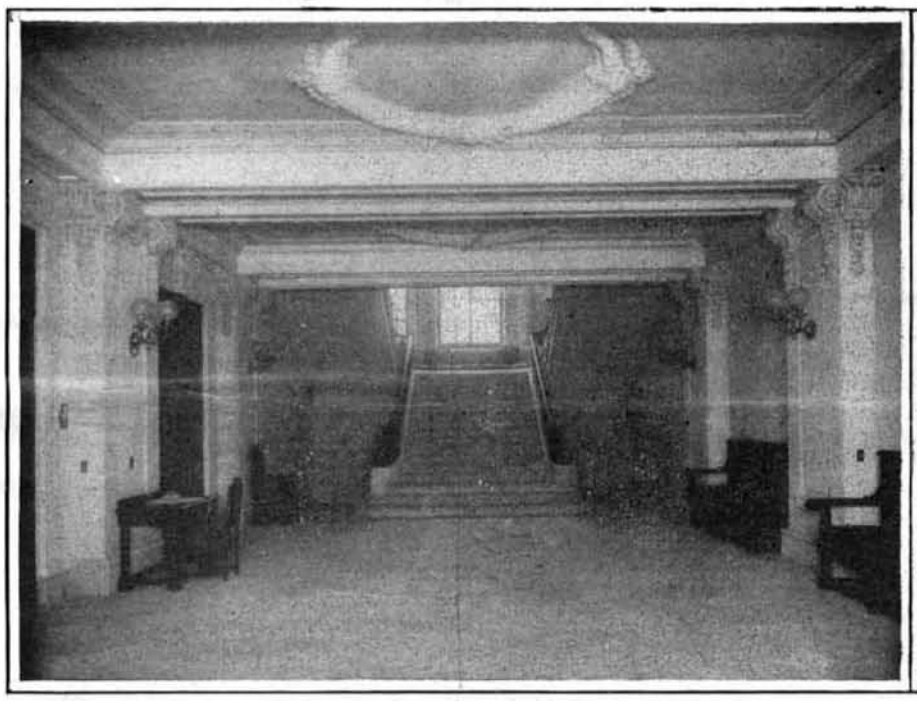
The building stands on West 54th Street, between Broadway and Eighth Avenue. It has a frontage of 131 feet and rises to a height of eight stories, towering prominently above the four-story brown-stone



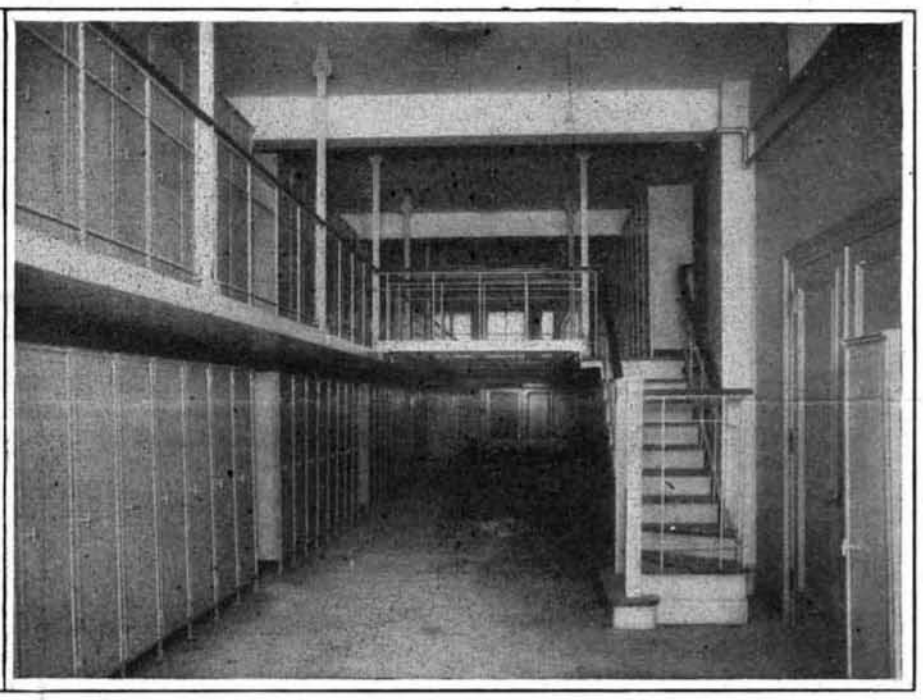
One of the Four Storage Floors.



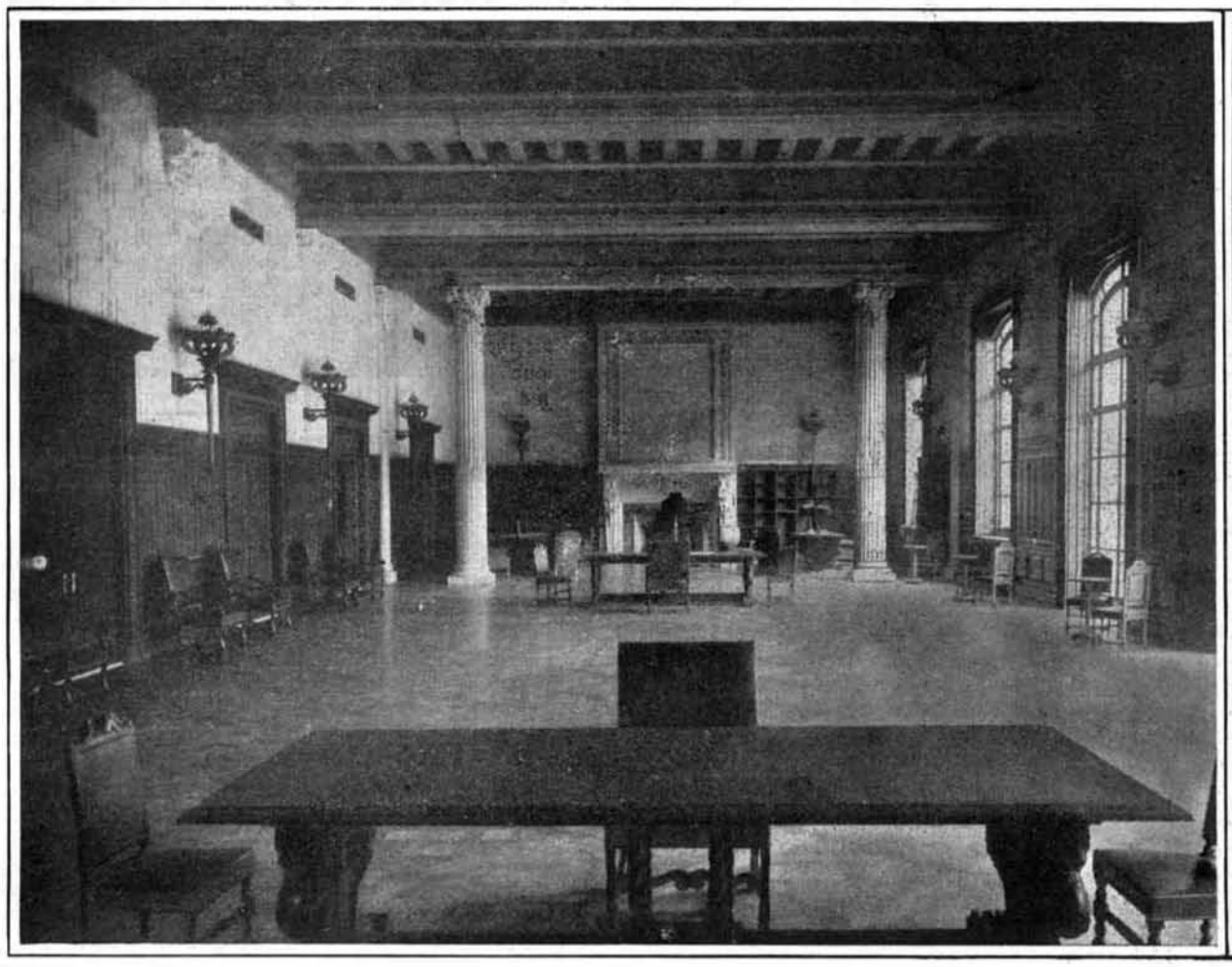
The Automobile Elevator.



The Main Entrance to the Club House.



The Members' Lockers on the Ground Floor.



The Main Assembly Hall, Modeled After That of a Famous French Castle.

The Façade of the Club House.

THE NEW HOME OF THE AUTOMOBILE CLUB OF AMERICA.

houses of this former rather exclusive residential section. The location is convenient to the many large new garages erected within the last two years in Broadway above Times Square and is handy to various lines of transportation, including the subway and elevated systems. The front of the building is of white granite and glazed with white brick with ornamental relief of green and white terra-cotta, offering a strong contrast to surrounding buildings.

The novel problem of combining luxurious club quarters with ample garage facilities was happily solved by architect Ernest Flagg, of New York, with the result that the new home of the club offers its members ample quarters for business and social gatherings and unsurpassed facilities for the storage and care and repair of their cars under the same roof. The total cost of the new home is approximately $750,000, of which $250,000 was paid for the plot of eight city building lots, $350,000 for the building, and about $150,000 for furnishings. Every precaution has been taken to guard against destruction or damage by fire. The building has a steel skeleton sheathed with concrete, and all the floors are of tile and cement. No wood or inflammable material is used, with the exception of a limited quantity for wainscoting, doors, and windows. Fire doors sheathed with steel close automatically by gravity in case of fire, shutting off the garage floors from the club rooms and the stairways and elevator shafts. All the gasoline used is stored in an underground tank outside of the building, and no cars are allowed to have their tanks filled on any floor but the first or ground floor garage. Lubricating oil is stored in a brick vault on this floor and kept under lock. Small portable tanks mounted on wheels and fitted with self-registering pumps are used for filling the fuel tanks of the cars, thereby avoiding the carrying of gasoline about in open buckets. On every column in the five garage floors is hung a pail of sand, and chemical fire extinguishers are liberally disposed about the garage, to be used in case of emergency.

Describing in detail the interior arrangement and furnishing of the club house, it is most natural to begin with the ground floor, which opens directly off the sidewalk and has three runways for cars into the garage. The first door on the east is the members' entrance, of chiseled white granite. Through a double set of heavy oak doors this gives into a lobby extending the full depth of the building, with a grand stairway of white marble at the rear. The lobby is finished in white, with marble floor, and is furnished with carved oak settees and chairs upholstered in red leather. Several doors open from the lobby on the left, the first one communicating with the garage superintendent's office and the garage. The second admits to the members' locker room, where there are one hundred private fireproof metal lockers where clothing and other articles can be kept under lock and key. This room has a mezzanine gallery all of steel, and there is not a thing in it that can burn.

Back of the grand stairway and beneath the first landing is a new departure with the club—the ladies' room. This is small, but is exquisitely finished with white enamel and gray silk-covered walls and furnished in polished French walnut.

Extending almost the full length of the front of the second floor is the great assembly hall rising through two floors. The walls are white, wainscoted to a height of eight feet with dark oak. Six great windows admit floods of southern sunlight, and opposite the windows an equal number of great double oak doors open into the big grill room and onto the stair landing. Parquetry is laid on the cement floor, and massive carved oak tables and chairs upholstered in red leather furnish the assembly room. At the east end a huge marble fireplace is flanked by black oak bookcases with adjustable shelves, in which are found bound volumes of the leading motoring periodicals of the world, and automobile literature. At the opposite end of the hall is a carved oak balcony for an orchestra, with a door behind opening onto a rear stairway.

The grill room has a cement floor in terra-cotta and white, white columns and ceiling, and the walls are covered with neutral-toned green wall paper. The tables and chairs are of black-stained weathered oak. As at present furnished, the room seats one hundred. On the north side are five large leaded glass windows, while there are three big skylights. The directors' room opens from one side of the grill room, while the butler's serving room and kitchen are on the other side

On the mezzanine floor above is the secretary's office and the general office, where the large volume of clerical work is done and where the touring and road-map department is quartered. A richly furnished pool and billiard room is also located on this same floor, having an entrance from the head of a flight of stairs rising from the landing at the top of the grand stairway. The ceiling is enameled white, while the walls are papered in dark red, and a rich, red carpet covers the floor. The tables and chairs are of mahogany.

Four of the floors above this are devoted to the storage of cars. They are admirably lighted by immense windows by day and electric lights at night. Although the city Edison current is at present employed, the plans contemplate the generation of current by steam-turbine-driven dynamos in the basement as soon as the machinery can be set up. Communication between all of the storage floors and the basement and roof is established by two electric elevators at the west end of the building, each 10 by 18 feet and having a lifting capacity of four tons. Flanking these are cement stairways for chauffeurs and servants. On each of the storage floors is a small room for chauffeurs, fitted with clock, telephone, tables, and chairs.

An interesting feature of the garage on the main floor is the three huge doors that admit cars. Instead of swinging back into the garage, where they would always be in the way and obstruct the light, they rise, folding inward horizontally at the middle. Directly back of one of these doors is a Fairbanks scales for weighing cars. To the east of the entrances is the superintendent's office, from which a small window looks into the garage, and on the west is the checker's room, where there are wire pigeonholes for letters and messages for the chauffeurs. The two big automobile elevator shafts are located also on the east end of the room, and in front of them is a large iron turntable for turning cars with their backs toward the elevators. On this floor are also washing stands and running water for cleaning the bodies and running gears of the machines.

The top floor is reserved for a repair department and testing room. Here is to be provided every facility for making repairs that can be found in the most up-to-date metropolitan garage. Delays in securing shipments have prevented installation of the necessary machinery as yet, but the purchases include one small and three large lathes, one milling machine, universal grinder, shaper, radial drill press, portable crane, and emery grinders, buffers, and similar small machine tools, all driven by individual electric motors. When complete, the repair shop will provide employment for a score of machinists, with space for any reasonable expansion.

In the center of the floor, cut off by wire screens reaching to the ceiling, is the testing department. This is to be equipped with a dynamometer and everything needed for measuring the power developed by motors and that delivered at the wheels of a machine, showing efficiency, friction losses, fuel consumption per horse-power-hour, taking indicator diagrams, etc. Of necessity an adequate description of this plant, to which the technical committee of the club is giving considerable attention, must be postponed to some future time.

The growth of the Automobile Club of America has been rapid since its organization in 1899, eight years ago. The active membership limit has been raised a number of times until it stands at one thousand. This limit has now been reached, and besides three hundred additional associate members, there is always a waiting list of applicants for membership. Among the members are many wealthy and socially prominent men. The club has international relations with all the national automobile clubs of Europe, and occupies the position of a national organization in this country, conducting national motor car exhibitions and technical contests, such as endurance, consumption, and commercial vehicle trials. It takes an active and influential part in affairs, having been in large measure instrumental in securing the passage of the $50,000,000 road improvement act in the New York legislature, in promoting touring at home and abroad, and in securing reasonable and just laws affecting the use of motor cars on the public streets and roads.

THE INTERNATIONAL FLEET AT JAMESTOWN.

Unquestionably, the most imposing feature connected with the opening of the Jamestown Exposition will be the long lines of battleships and cruisers which have gathered from all parts of the world to do honor to the occasion. Of the sixty-seven ships of importance there assembled, twenty-seven fly the flags of friendly foreign nations, and the balance that of the United States. The visiting ships, including those of the larger size, are mainly of the armored-cruiser type, the remainder consisting of protected cruisers and a few gunboats. To be exact, there are fourteen armored vessels, nine protected cruisers, two gunboats, and one training ship. In the main, the foreign ships are representative of the latest ideas of the powers in the various types that are represented, up to the close of what might be called the ante-bellum period, or the period which closed with the Russo-Japanese war. There is, however, one important exception, which is furnished by the Japanese themselves, who have sent over, in that splendid ship the "Tsukuba," the first of a new type—the cruiser-battleship—to make its appearance on the high seas.

In dispatching the "Tsukuba" to Jamestown, the Japanese have at once paid us the compliment of sending their latest and finest ship of its class, and, incidentally, they present to the United States concrete evidence of the fact that they are now entirely independent of foreign ship-builders, and are capable of turning out in two years a first-class warship—hull, engines, guns, and equipment—completely of Japanese manufacture.

The "Tsukuba" is of about the same displacement as the British "Good Hope" and the United States "Washington." But she has one inch more belt armor than the British, and two inches more than the American ship. She carries twenty-eight guns, as against eighteen on the "Good Hope" and twenty on the "Washington." Of these, the main armament consists of four 12-inch guns, as against two 9.2-inch on the "Good Hope," and four 10-inch on the "Washington." The intermediate battery on the Japanese ship consists of twelve 6-inch and twelve 4.7-inch guns, while the British and American cruisers carry each sixteen 6-inch guns. The "Tsukuba," therefore, shows a great superiority of gun power, even over the "Washington"; but her speed of 21 knots is a knot and a third less than that of the "Washington," and 3½ knots less than the maximum speed of the "Good Hope." The next in importance of the foreign cruisers is the armored cruiser "Victor Hugo," representing the French republic, an exceedingly handsome vessel of 12,416 tons and 22 knots speed. She carries a 6¾-inch belt, and her battery of four 7.6-inch and sixteen 6.4-inch guns is carried mainly in turrets with a high command of from 26 to 34 feet above the sea. The 7.6's are protected by 8 inches of armor, and twelve of the 6.4's are mounted in pairs on the broadside in double turrets protected by 5½ inches of armor; the other 6.4's are mounted on the main deck in four casemates with four inches of protection.

In point of size and speed, though not of gun power, the next largest ships are the three armored cruisers "Hampshire," "Roxburgh, and "Argyll" of the British squadron, vessels of 10,850 tons displacement, and from 22½ to 23½ knots speed, carrying four 7.5-inch guns in single turrets with 6 inches protection, and six 6-inch guns in casemates. The belt protection is 6 inches in thickness.

Next in importance are the twin armored cruisers "Roon" and "Yorck" of the German navy, each of 9,050 tons displacement and over 21 knots speed. The armament, which is much heavier than that of the "Hampshire" class above mentioned, consists of four 8.2-inch guns carried in two turrets with 6 inches of armor protection, and ten 6-inch guns mounted in a central redoubt of 4-inch armor, and so placed that four of them can be fired dead ahead and four dead astern. The only point in these fine ships which can be criticised is the belt, which has a maximum thickness of only 4 inches.

France, Italy, and Austria each contribute an armored cruiser of between 7,000 and 8,000 tons displacement, France sending the "Kleber" of 7,700 tons and 21.27 knots, carrying eight 6.4-inch in 4-inch armor turrets and four 4-inch guns in casemates. The "Kleber" has the characteristic high freeboard of the French cruisers; but like the German "Roon" and "Yorck" her armor is over-light, the belt being but 4 inches in thickness. Of about the same displacement is the Italian "Varese," of 20.2 knots, mounting one 10-inch and two 8-inch in 6-inch-armor turrets, and fourteen 6-inch in 6-inch casemates or behind shields. The belt armor is 6 inches in thickness. The "Varese" is a type of cruiser designed and built in Italy, which combines, if we except the "Tsukuba" and "Indomitable," more fighting efficiency on a given displacement than any armored cruiser that we know of. Two of this type went successfully through the Japanese war as part of the Japanese armored cruiser division. Another armored cruiser of the same displacement is the "Sankt Georg," of the Austrian navy, mounting two 9.4-inch guns, five 7.6-inch, and four 6-inch. The belt is 6½ inches in thickness, the barbettes have 8 inches, and the side of the lower deck has 8¼ inches of Krupp armor protection. These features, combined with a speed of 21 knots, render this vessel an exceedingly fine example of the armored cruiser class. A little smaller than the "Sankt Georg" is the "Kaiser Karl VI.," also of the Austrian navy. Her speed is 20.8 knots, and she mounts two 9.4-inch and eight 6-inch guns; the belt being 8½ inches, and the barbette armor 8 inches in thickness.

The protected cruiser class is represented by the two German ships "Bremen," of 3,250 tons and 23.2 knots speed, and "Niobe," of 2,650 tons and 21.6 knots speed, each vessel mounting ten 4.1-inch guns and several 1-pounders. Japan has the "Chitose," a protected cruiser of 4,760 tons and 22.5 knots, mounting two 8-inch and ten 4.7-inch guns. Italy sends the protected cruisers "Etruria" and "Fieramosca," the former of 2,280 tons and 19.8 knots, carrying two 6-inch and eight 4.7-inch guns, and the latter of 3,600 tons and 17.5 knots, mounting a somewhat out-of-date battery of two 10-inch and six 6-inch guns. Austria sends the protected cruiser "Aspern," of 2,437 tons and 20 knots, and a battery of eight 4.7-inch guns. Sweden is represented by the armored cruiser "Fylgya," of 4,060 tons and 21.5 knots, mounting eight 6-inch guns in

THE INTERNATIONAL FLEET AT JAMESTOWN.

VISITING SHIPS.

Name.	Type.	Tons Displacement.	Knots Speed.	Guns.	Armor.
Great Britain.					
Good Hope..	Armored cruiser	14,100	24.5	2 9.2-in.; 166-in.	Belt 6 in.; bte. 6 in.
Hampshire...	"	10,850	22.4	4 7.5-in.; 6 6-in.	"
Roxburgh.....	"	10,850	23 6	"	"
Argyll..	"	10,850	22 3	"	"
France.					
Victor Hugo..	Armored cruiser	12,416	22.00	4 7.6-in.; 16 6.4in.	Belt 6¼ in.; tur. 8 in.
Kleber.....	"	7,700	21.27	8 6.4-in.; 4 4-in.	Belt 4 in.; tur. 4 in.
Jean Bart*....	.....	.....	.....	.....	.....
Germany.					
Roon.....	Armored cruiser	9,050	21.00	4 8.2-in.; 10 6-in.	Belt 4 in ; tur. 6 in.
Yorck.....	"	9,050	21.4	"	"
Bremen.....	Protected cruiser	3,250	23 2	10 4.1-in.; 10 1-pdr	Deck 2 in.
Niobe.....	"	2,650	21 6	10 4.1-in.; 14 1-pdr	Deck 2 in.
Panther.....	Gunboat.	977	13.5	2 4.1-in.; 6 1-pdr.	.....
Japan.					
Tsukuba.	Cruiser battleship	14,000	21 00	4 12-in.; 12 6-in.; 12 4.7-in.	Belt 7 in.; tur. 9 in.
Chitose.....	Protected cruiser	4,760	22.5	2 8-in.; 10 4.7-in.	Deck 4½ in.
Italy.					
Varese.....	Armored cruiser	7,400	20.2	1 10-in.; 2 8-in.; 14 6-in.	Belt 6 in.; bte. 6 in.
Etruria.....	Protected cruiser.	2,280	19 8	2 6-in.; 8 4.7-in.	Deck 1 in.
Fieramosca....	"	3,600	17.5	2 10-in.; 6 6-in.	Deck 2 in.
Austria.					
Sankt Georg..	Armored cruiser	7,400	21.00	2 9.4-in.; 5 7.5-in.; 4 6-in.	Belt 6¼ in.; tur. 8 in.
Kaiser Karl VI	"	6,325	20.8	2 9.4-in.; 8 6-in.	Belt 8½ in.; bte. 8 in.
Aspern....	Protected cruiser	2,437	20.0	8 4.7-in.; 12 3-pdr	Deck 2 in.
Sweden.					
Fylgya.....	Armored cruiser	4,060	21 5	8 6-in.; 14 6-pdr	Belt 4 in.; tur. 5 in.
Chile.					
Baquebano....	Training ship	2,330	13.7	4 4.7-in.; 2 12-pdr	.....
Argentina.					
Buenos Ayres.	Protected cruiser	4,500	24.0	2 8-in.; 4 6-in.; 6 4.7-in.	Deck 5 in.; sh'lds 4½in.
Portugal.					
Dom Carlos...	Protected cruiser	4,100	22.0	4 6-in.; 8 4.7-in.	Deck 4½ in.
Brazil.					
Riacheulo. .	Battleship	5,700	16.5	4 9.4-in.; 6 4.7-in	Belt 11 in.; tur. 10 in.
Barroso.....	Protected cruiser	3,450	20.5	6 6-in.; 4 4.7-in.	Deck 3½ in.
Tamoyo	Gunboat	1,030	23.0	2 4.7-in.; 6 6-pdr.	Deck 1 in.

UNITED STATES BATTLESHIP FLEET.

Minnesota	Battleship	16,000	18.8	4 12-in.; 8 8-in.; 12 7-in.	Belt 9 in.; tur. 12 in. and 8 in.
Vermont... ..	"	16,000	18.3	"	"
Louisiana.....	"	16,000	18.8	"	Belt 11 in.; tur. 12 in. and 8 in.
Connecticut..	"	16,000	18 5	"	"
Georgia	"	14,948	19 2	4 12-in.; 8 8-in.; 12 6-in.	"
Nebraska.....	"	14,948	19.0	"	"
New Jersey...	"	14,948	19.2	"	"
Rhode Island..	"	14,948	19.0	"	"
Virginia.....	"	14,948	19.0	"	"
Maine.....	"	12,500	18.0	4 12-in.; 16 6-in.	Belt 11 in.; tur. 12 in.
Missouri.....	"	12,500	18.1	"	"
Ohio	"	12,500	17.8	"	"
Alabama.....	"	11,552	17.0	4 13-in.; 14 6-in.	Belt 13½ in.; tur. 13in.
Illinois.... ...	"	11,552	17 4	"	"
Kearsarge	"	11,520	16.8	4 13-in.; 4 8-in.; 14 5-in.	Belt 13½in.; tur. 13 in. and 8 in.
Kentucky.....	"	11,520	16 9	"	"
Iowa	"	11,346	17.1	4 12-in.; 8 8-in.; 4 4-in.	Belt 14 in.; tur. 12in. and 8 in.
Indiana.	"	10,288	15.6	4 13-in.; 8 8-in.; 4 6-in.	Belt 18 in.; tur. 13 in. and 8 in.
Washington ..	Armored cruiser	14,500	22.3	4 10-in.; 16 6-in.	Belt 5 in.; tur. 10in.
Tennessee ..	"	14,500	22 1	"	"

turrets protected by 5 inches of armor. Chile sends the training ship "Baquebano," and Argentina the protected cruiser "Buenos Ayres," of 4,500 tons, 24 knots, and battery of two 8-inch, four 6-inch, and six 4.7-inch guns. Portugal is represented by the "Dom Carlos," a protected cruiser of 4,100 tons and 22 knots and a battery of four 6-inch and eight 4.7-inch guns. Brazil sends the old-time battleship "Riachuelo," of 5,700 tons and 16.5 knots, carrying four 9.4-inch and six 4.7-inch guns. She also is represented by the "Barroso," a protected cruiser of 3,450 tons and 20.5 knots, mounting six 6-inch and four 4.7-inch guns, and the gunboat "Tamoyo," of 1,030 tons and 23 knots and a battery of two 4.7 and six 6-pounder guns.

UNITED STATES FLEET.

The United States fleet assembled at Hampton Roads to receive the visiting squadrons is one of the strongest aggregations of naval power ever drawn up for review. In the fact that of the forty ships or more twenty are armored, and that eighteen of them are battleships, the composition of the fleet is strictly representative of the United States navy, especially in its later development. Ours is essentially a battleship navy; and our naval constructors have been careful to maintain the national reputation for mounting exceedingly heavy batteries—a fact which is at once evident from a study of the number and caliber of the guns given in the accompanying table. Another satisfactory feature evident in this table is that, since the period of the Spanish war, we have built our ships strictly in classes. There is no instance of the construction of an individual ship, whose design differs widely on some point or other from every existing class.

The most modern and formidable vessels of the fleet are the four battleships of the "Minnesota" class, all of 16,000 tons, 18.5 knots, and mounting four 12-inch, eight 8-inch, and twelve 7-inch. In the "Connecticut" and "Louisiana" the belt is 11 inches, in the "Minnesota" and "Vermont" 9 inches; otherwise, the ships are practically identical. The 12-inch guns have 12 inches and the 8-inch guns 8 inches of protection, all of them being mounted in pairs in turrets. Of the world's battleships designed before the late war, these are the most powerful and best protected—with the possible exception of the Japanese "Kashima" and "Katori," whose four 10-inch guns will by some authorities be preferred to eight 8-inch.

The five battleships of the "Georgia" class (see table) are about 1,000 tons smaller than the "Minnesota," but have a knot more speed. The main armament is identical; the intermediate battery consisting of 6-inch in place of 7-inch guns. The only objection that can be urged against these ships is that they carry the superposed turret—whereby a heavier all-round 8-inch fire is obtained at the expense of undesirable complication of mechanism and no little interference of gun fire. Nevertheless, these are most powerful ships, with good freeboard, high speed, generous coal supply, and a battery heavier than that of any foreign vessels of their date.

The nine battleships above mentioned are by far the most formidable portion of the fleet at Hampton Roads. In the "Maine," "Missouri," and "Ohio," of 12,500 tons and 18 knots, we have ships of excellent protection but considerably less battery power, 8-inch guns being excluded. The "Alabama" and "Illinois," of a knot less speed and 1,000 tons less displacement, carry the 13-inch gun in their main battery, and like the "Maine" class have no intermediate 8-inch guns; but all of these five ships are heavier armed than battleships of the same date built for foreign navies. The "Kearsarge" and "Kentucky," of the same displacement, and about the same speed as the "Alabama," carry four 8-inch guns in superposed turrets above the 13-inch guns, and they have a numerous broadside battery of 5-inch. The "Iowa," of about the same displacement and speed as the "Kentucky," is an improved "Indiana," being about 1,000 tons larger with a knot and a half more speed, and a similar disposition of the battery, the 12-inch taking the place of the 13-inch gun.

In the armored cruisers "Washington" and "Tennessee," of 14,500 tons displacement, the United States navy possesses two ships which but for the overlight waterline armor could be reckoned as of the cruiser-battleship type which promises to have something of a vogue during the next few years. They carry a battery of four 10-inch guns in turrets protected with 10 inches of armor, and they have a broadside battery of sixteen 50-caliber 6-inch guns. Limitation of space prevents any detailed reference to the less important United States ships at the review.

Taken altogether, the United States fleet at Hampton Roads is a subject for just pride on the part of American citizens; and when the President steams down the lines and receives the salvos of the visiting and home fleets, it will be a subject of well-earned gratification to him that his efforts for a long period of years should have contributed to the production of so many and such formidable warships as will fly the American flag on that day.

OPENING OF THE JAMESTOWN EXPOSITION.

BY JOHN T. MAGINNIS.

What has been described as a "Colonial city beautiful" has sprung up at Sewell's Point, on the shores of Hampton Roads, and Norfolk and the towns that nestle about this historic body of water are prepared to receive the throngs of visitors to the Jamestown Exposition, which will be formally opened by President Roosevelt April 26. The exposition is in celebration of the tercentenary of the establishment of the first permanent English settlement in the new world at Jamestown.

Jamestown, a peninsula when Capt. John Smith landed there May 13, 1607, now an island cut off by the currents of the James River, is some thirty-odd miles up the river, above Hampton Roads. The town as such ceased to exist two hundred years ago and the island now is partly used for farming purposes. The historic portion is owned by the Association for the Preservation of Virginia Antiquities, which tends it with reverent care and has made valuable research through excavation. The government has built a retaining wall about part of the island to protect it from further encroachments of the river and has erected on the island a monument to the first House of Burgesses—the first representative body of the people assembled on this continent. The Colonial Dames have restored the Old Church, the dismantled tower of which alone remained, and the Daughters of the American Revolution have erected a copy of Hays Barton, the home in Devon, England, of Sir Walter Raleigh. The Pocahontas Memorial Society has been engaged in raising a subscription of $10,000 for a monument to the Indian princess whose interposition gave to the English their lasting foothold. The A. P. V. A. has erected a statue of Capt. John Smith.

The opening date of the exposition commemorates that on which Capt. Newport's little fleet, consisting of the "Susan Constant," the "Discovery," and the "Godspeed" anchored off Cape Henry, named after the then Prince of Wales, when Capt. John Smith, going ashore, planted a cross near where is now the Cape Henry lighthouse.

The ceremonies incident to the formal opening on April 26, 1907, will be under the direction of Mr. G. T. Shepperd, secretary of the Jamestown Exposition Company, assisted by Lieut. P. H. Bagby, Sixth United States Infantry, military *attaché* to the department of the secretary. At sunrise on April 26 the Norfolk Light Infantry Blues, stationed at the exposition grounds, will fire a salute of 300 guns to usher in the commencement of the day opening the Jamestown Tercentennial Exposition in commemoration of the 300th anniversary of the first English settlement of America.

Upon the arrival of President Roosevelt on the "Mayflower" in Hampton Roads, a salute will be fired by the United States and foreign warships there assembled. When the President arrives at the exposition grounds, he will be met at the end of the government pier by a military escort, and will be saluted by the United States artillery stationed on the exposition grounds. Promptly at the hour of 11:30 the President will be escorted to the reviewing stand, on Lee's Parade in the rear of the auditorium building, where appropriate exercises will take place. When the President presses the gold button, putting the machinery of the exposition in motion, it will at the same time be a signal for a salute to the Union by the United States and foreign ships assembled in Hampton Roads and by the garrison at Fort Monroe. At the conclusion of the salute all of the bands on the exposition grounds will play "The Star-Spangled Banner," at which time all the troops will salute the national anthem by presenting arms, and the entire concourse will be expected to uncover during the rendition of this ceremonial.

Immediately thereafter the President of the United States will review the parade, of which Major-General Frederick D. Grant, of the United States Army, will be grand marshal, which will be participated in by the soldiers and sailors of the United States and foreign governments and the National Guard. The governors of the different States of the Union having military representation in the parade will participate therein, together with their staffs. Boxes on the reviewing stand will be assigned to those governors who do not participate in the parade.

On the reviewing stand, besides the President of the United States and his cabinet, will be the diplomatic corps, officers and directors of the Jamestown Exposition Company, members of Congress, the general assembly of Virginia, United States and State commissioners to the Jamestown Tercentennial Exposition, official representatives from the different States of the Union, officers of the various historical societies and the mayors and municipal officers of the cities surrounding Hampton Roads.

The various States have responded liberally to calls for appropriations and some twenty-five have buildings on the grounds, nearly all permanent structures of Colonial design, alined along the waterfront, where they will remain to form the nucleus of Norfolk's prospective new suburb, which may become known as Colonial Park.

The resources of the States will be shown by exhibits in what is known as the States Building.

The principal exposition buildings are: Hall of Congresses, 236 feet long and 160 feet wide, with wings 62 feet wide; auditorium, 150 x 250 feet; Mining and Metallurgy, 100 x 250 feet; Manufactures and Liberal Arts, 280 x 550; Machinery and Transportation, 280 x 550 feet; States Exhibits Palace, 300 x 500; Food Products, 300 x 250 feet; History and Historic Arts, 100 x 300 feet; Education Buildings, two, connected by colonnades with wings of Hall of Congresses, each 124 x 129; Marine Appliances, 26,000 square feet; Palace of Commerce, 11,500 square feet.

The grounds of the Jamestown Exposition are ideally located. Sewell's Point has historic interest of its own and overlooks the scene of the great marine duel between the "Merrimac" or "Virginia" and the "Monitor." Topographically the exposition site was particularly adapted to its purpose and susceptible to the adornment and general treatment that adds so much to the attractiveness of an exposition. Its marine frontage made possible the naval display, and its beach adds the delight of sea bathing. It extends along Hampton Roads two and a half miles, and Boush's Creek skirts it for a mile and a half. Covering 600 acres, more than the World's Fair at Chicago had, the grounds offer ample room for the buildings, broad boulevards, lawns, groves, and rambles, and the Lee Parade of thirty acres. Near this is the military camp with sloping ground, giving natural drainage.

More than a million plants have been set out and

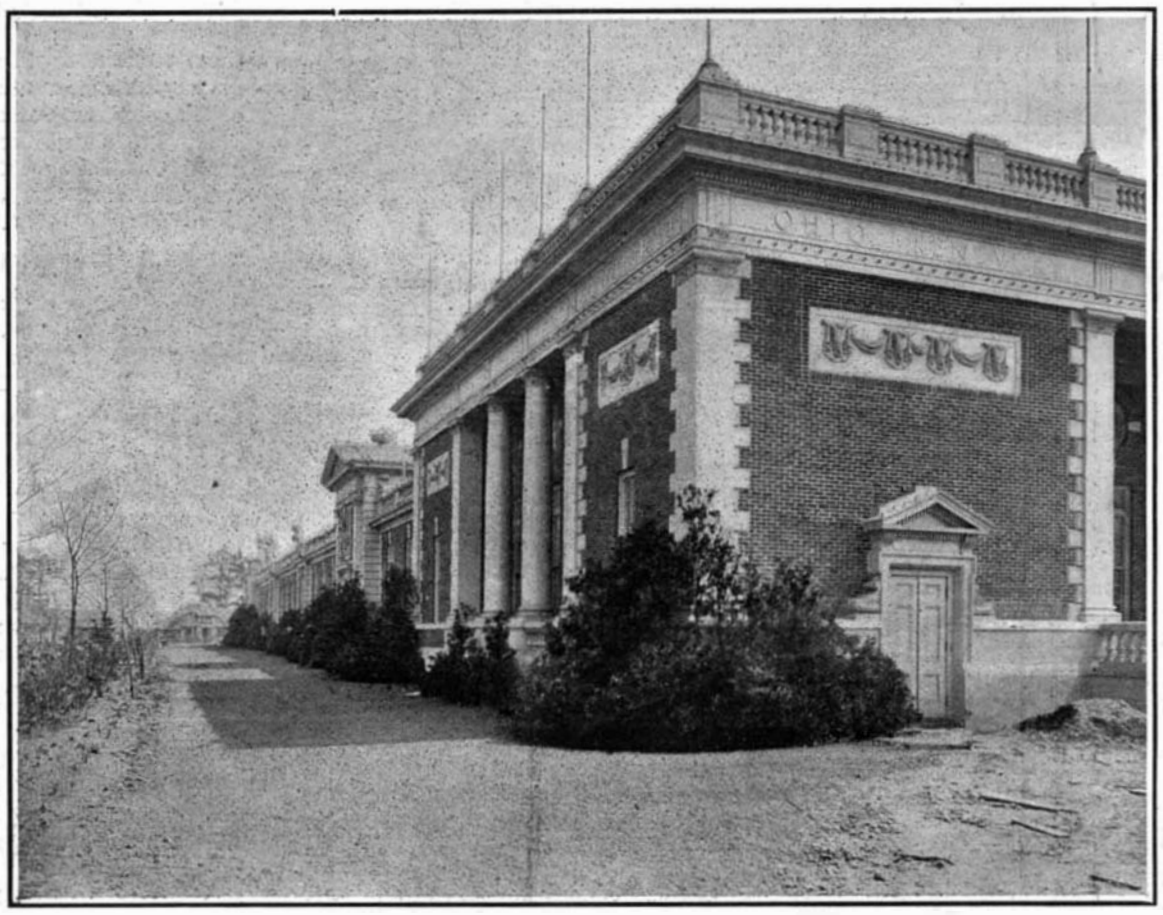
are now enjoying healthy growth, and these with shrubs and trees have been so selected as to give perpetual bloom. Hundreds of apple trees of large growth, some a foot thick, have been transplanted from the neighboring country, while many other trees of great variety have been brought from afar. The arboriculture of the grounds is in itself an interesting and attractive exhibit. Along the two and a half miles of water front a quadruple row of trees has been planted, and similar work has been done lavishly in all parts of the grounds, while grassed places have been adorned with innumerable flower beds. The roads are of macadam and the walks, all broad, are concrete. A canoe trail winds for two miles through the grounds, passing through bits of picturesque woodland.

To comprehend the plan of the grounds, the best method is to go directly across the middle from the main entrance at the south to the water basin formed by the great double pier erected by the government. The piers are 800 feet long and 200 feet wide and are connected at the outer ends by extended bulkheads and an arched bridge beneath which the naval launches and small craft from the fleet may enter. At the head of the basin called Smith Harbor is Discovery Landing, named for one of Newport's fleet, while the piers are similarly named for the other vessels of the fleet, the "Susan Constant" and the "Godspeed." From the landing extends the broad Raleigh Square back to a similarly broad expanse, in which are the lagoons.

The piers with their towers for wireless telegraphy and searchlights, the Square and the lagoons, the gardens and buildings on either hand, the innermost at the back of the Square connected with those nearer the water by peristyles, make this central feature decidedly imposing.

On either side of the Square are the United States government buildings—to the right the Smithsonian Institution exhibits and another exhibits building, while to the left are the Fisheries Building and those devoted to other exhibits, including the displays from Porto Rico and Alaska, and the officers' club. Within the Square on either side is, on the one hand, the reproduction in topographical verity of the Panama isthmus and canal; on the other, a large tank for the larger marine specimens, seals, etc.

To the right of the lagoons is the Manufactures and Liberal Arts palace, and to the left the building of Machinery and Transportation. At the head of the lagoons is the Auditorium, a handsome structure, with its classic dome, lofty portico, and wide-stretching wings.



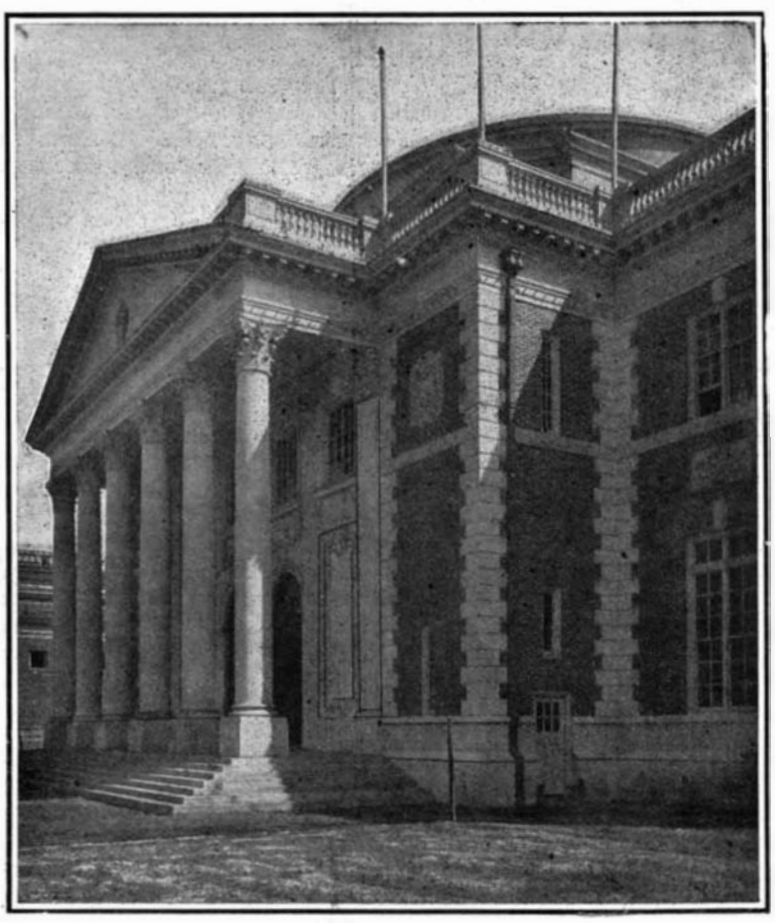
States Exhibits.

The Auditorium will be the scene of daily conventions. Some 150 conventions are scheduled for the exposition. To meet the hall requirements another building has been erected near the entrance, while a citizens' committee has provided for many of the gatherings in Norfolk.

Willoughby Boulevard skirts the water front, and along it, flanking the central government buildings, are the beautiful State buildings. Kentucky, at the extreme right in a pine grove and next the Inside, a hotel accommodating 3,000 guests, has reproduced Daniel Boone's fort. Virginia has given a fine example of the type of Georgian Renaissance such as is seen in such old homes as Monticello, Jefferson's mansion at Charlottesville, Va., and Montpelier, the home of Madison. Maryland has copied the home of Charles Carroll, of Carrollton; Pennsylvania has the Independence Hall, and Massachusetts the old State House. New York has a conspicuous structure with an elliptical dome, a high Colonial portico and wings; New Jersey has a copy of Washington's headquarters at Morristown; Delaware has a Colonial dwelling; Connecticut reproduces the home of Col. Talmadge, of Washington's staff; Rhode Island copies her first State house; Georgia reproduces Bulloch Hall, the home of President Roosevelt's mother, where on June 10 the President will deliver an address on the occasion of the building's dedication; Ohio has "Adena," the first stone house erected by English-speaking people west of the Alleghenies, which was the executive mansion when Chillicothe was the State capital; New Hampshire reproduces the home of John Langdon, and Maine the home of Longfellow. North Carolina, Illinois, and Missouri have handsome Colonial buildings. Still other States with buildings are Florida, North Dakota, Vermont, Alabama, Tennessee, Arkansas, Louisiana, West Virginia (which also is erecting a huge coal monument), Michigan, and California. Oklahoma provides for her exhibits in her building, while the other State buildings are for social purposes and display of only things of art and historic interest.

These buildings are in the main of brick with white trimmings. In appearance they harmonize with the exhibit palaces, which have brick veneer instead of staff, which is used only in the trimmings. This gives an appearance of permanency, and relieves the aspect of that garishness and newness common to most exposition architecture.

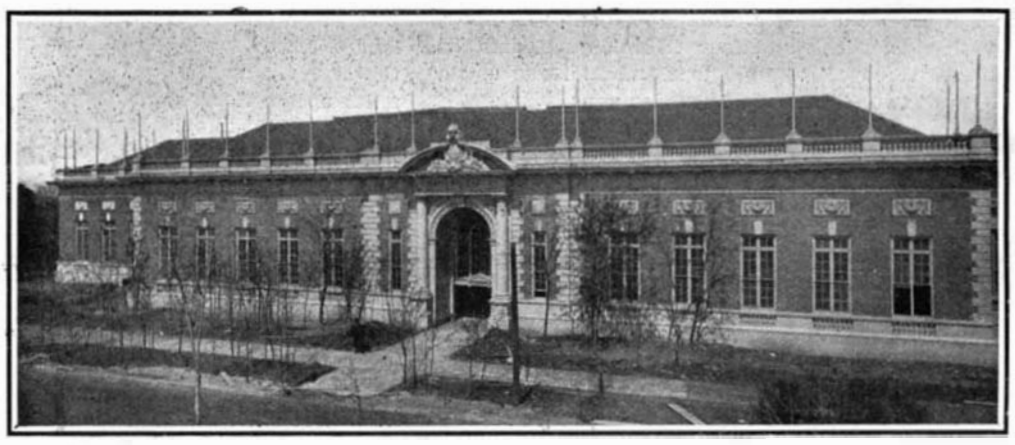
In the Auditorium group of buildings are, to the right, the concrete and fireproof History and Historic Art and Fine Arts Buildings, and the Food Products Building, while to the left of the Auditorium are the Marine Appliance Building, and next it the Minerals, Mines and Metallurgy triple building. Farther to the left and east is the Graphic Arts Building, which is shared in part by the Social Economy department. The Boston Printers' Society has arranged the plan of



Photographs copyright 1907 by Jamestown Official Photographer Corporation.

Main Entrance of Auditorium Palace.

Transportation Building.



Manufactures Building.

BUILDINGS OF THE JAMESTOWN EXPOSITION.

the Graphic Arts exhibit and it will duly impress the visitor with the conspicuous part printing has played in the advance made by humanity in civilization in the last three hundred years.

At the eastern end of the grounds are the Canoe Trail, the Philippine Reservation and Athletic Field, and the Life Saving Station. On the extreme west are the War Path, which corresponds to the Midway at Chicago; the Negro exhibit and the Palace of Commerce, which will be devoted to display of wares, domestic and foreign.

Perhaps no exhibit will attract more attention than that of Power and Alcohol. The government will conduct tests, experiments, and demonstrations, and the agriculturist will learn how many things about him may be converted into alcohol, and profitably so, under the denatured alcohol act of Congress. Experiments will be made to determine how inexpensively denatured alcohol can be manufactured, and show its qualities as a fuel compared with coal and gasoline.

Officials of the United States Geological Survey have in charge the Mines and Metallurgy exhibits, and processes will be shown. The Building Material exhibits will be large and much attention will be paid to cement and to concrete work.

Farmers will find the States Exhibits palace devoted mainly to agriculture, and in it, besides the great staples from all parts of the country, fresh fruits and green vegetables and berries, everything in season, together with work in soils, fertilizers, and seeds. The exhibit of farming implements will be extensive.

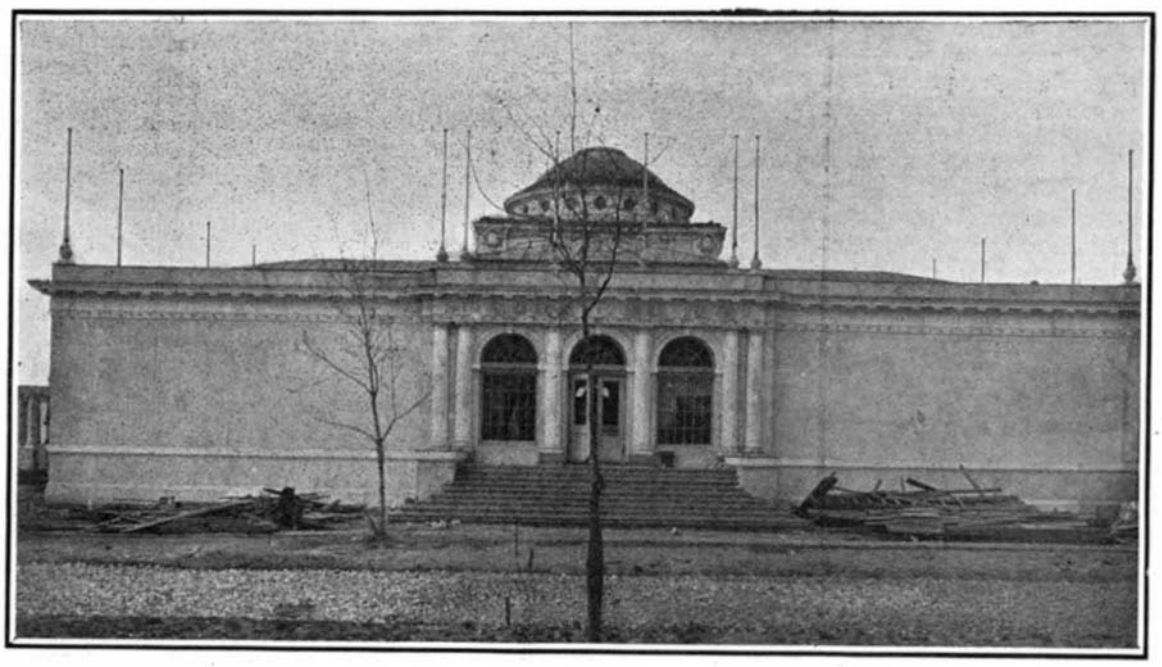
In the Machinery and Transportation Building the Pennsylvania Railway will show a section of its East River tunnel tube, 23 feet in diameter, and within the tube will be one of the company's new steel cars. The Baldwin firm will show four types of locomotives, and of these two will be so installed as to have their machinery in motion. Automobiles will be shown in great variety and the exposition will be the objective this year of the Glidden tours, which will include the Virginia battlefields and reach to Virginia Beach, at which point will be found a beach course for racing of 80 miles extending to Hatteras.

Aeronautical devices are likewise to be shown. A special building has been erected and in it will be placed aeronautical paraphernalia, models, charts, etc. There are to be contests between balloons, dirigibles, aeroplanes, and various characters of flying machines, kites, etc. The contests will be not only of the sporting kind, but scientific both in reference to airship construction and in relation to the elements.

The exposition will be the rendezvous of athletes, and the field events will bring together a large number of champions in their respective lines. The auto-boat will be much in evidence and Hampton Roads will witness a series of yacht races for craft of varied design and racing length. Five cups are offered for the international races—the President Roosevelt, the Kaiser Wilhelm, the King Edward, the Sir Thomas Lipton, and the Exposition cup. Other cups are offered for special regattas and for free-for-all racing. The National Rowing Association goes to Philadelphia for its annual championships, but comes to Jamestown afterward and an interesting series of boat races is promised, off Sewell's Point.

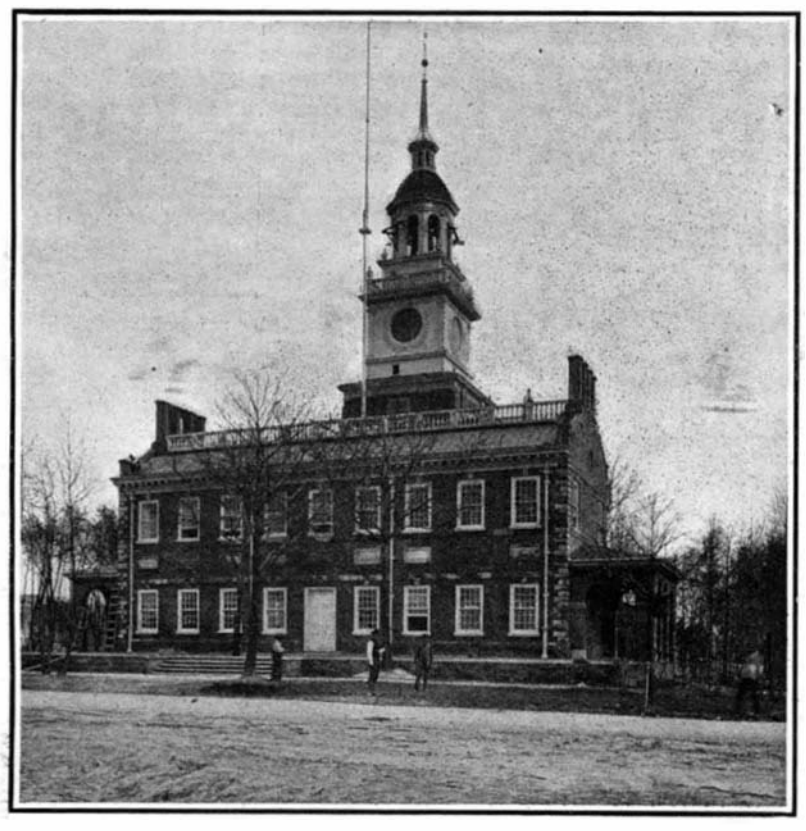
One of the most instructive features of the Exposition will be the Negro exhibit, for which Congress appropriated $100,000. A building has been erected on the grounds from a design made by a colored architect, W. S. Pittman, of Washington. It is 125 x 250 feet area, two stories, and in the Colonial style. The life of the race on American soil began at Jamestown twelve years after the landing of the English, and the exhibits will represent the stages of negro life and progress. A striking exhibit will be a series of model groups with appropriate scenic accessories illustrating in chronological order the various stages of the negro's history. This is the work of Meta Vaux Warrick, a young colored sculptor of Philadelphia, graduate of the Drexel School of Fine Arts. There will be exhibits from the several colored schools, such as Hampton, Tuskegee, Fisk, Livingstone, and Normal.

Collections have been made of the products of negro labor in all branches—agricultural, horticultural, mechanical, and in the liberal arts—and furthermore will be shown exhibits representing his activities in the professions, in art, music, and literature.



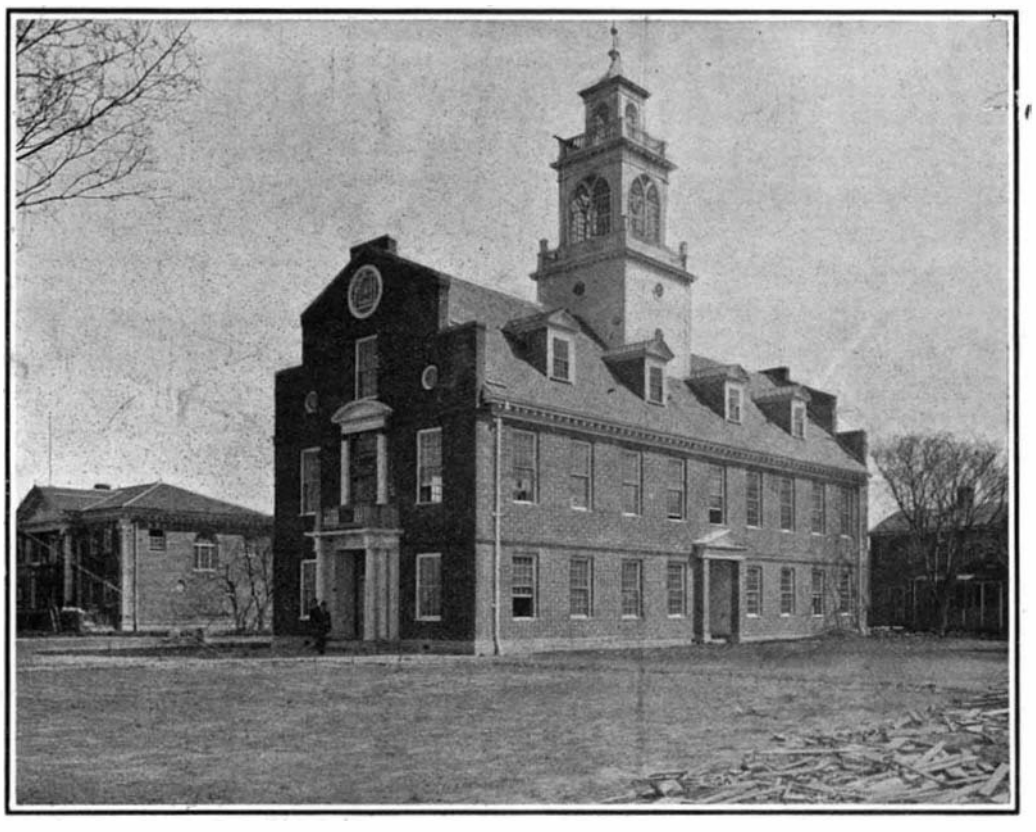
Government Museum Building.

Maryland State Building.



Photographs copyright 1907 by Jamestown Official Photographer Corporation.

Pennsylvania State Building.



Reproduction of Old State House, Boston. Boston massacre occurred on the square in front of this building.

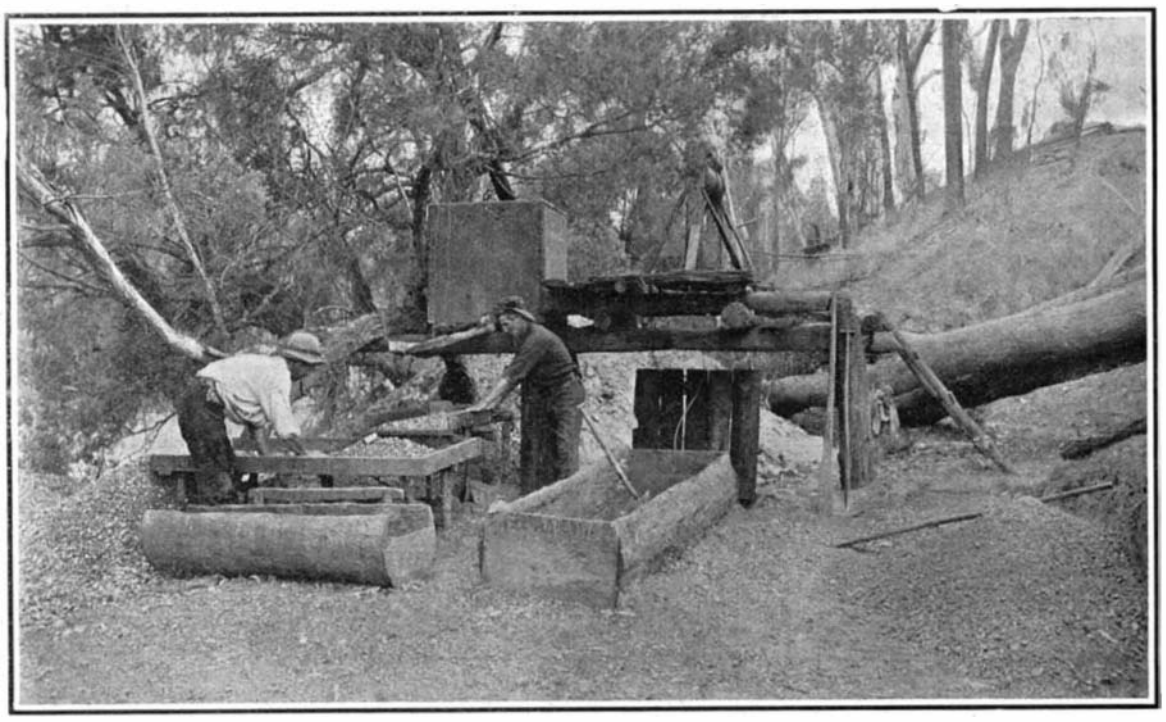
Massachusetts State Building.

BUILDINGS OF THE JAMESTOWN EXPOSITION.

AUSTRALIAN SAPPHIRES.

BY JOHN PLUMMER.

Sapphires are found in all the Australian states, but chiefly at Anakie, in Queensland, where they are obtained in considerable quantities. The sapphire-bearing area, according to Mr. B. Dunstan, assistant Queensland geologist, is of considerable extent, about fifty square miles, extending north and south of Sapphire Town, as the Anakie settlement is designated. The deposits are mostly confined to the granite country, although rarely met with in existing streams. Generally, they are found high above the beds of the creeks, but roughly parallel with the creeks. The sapphires do not travel very far, and if the deposits containing them are washed away, the stones will be found just below any remaining portions, or perhaps only a short distance away. Associated with the sapphire deposits is a quartzite rock, locally known as "billy," which is general in all the eastern portions of the field in which the gems are found, and, when met with in unprospected localities, is regarded as an indication of the probable existence of sapphires in the vicinity. There are, however, localities in which the sapphires are found, although no traces of the "billy" are to be discovered, hence it is assumed that while the rock may have been plentiful in the sapphire-bearing country, it is not that from which the gems originally came.



Treating Sapphire Wash Dirt.

In some places bowlders of basalt invariably occur with the sapphires, and pebbles of basalt in which pleonaste is imbedded are often found. There are numerous basalt peaks scattered over the Anakie field, and a pale blue sapphire, having a thick, black scaly coating on one side, together with abundance of pleonaste, was picked up on the summit of one of these. The stone was obtained at a height of 500 feet above the highest of the sapphire alluvial deposits, and, although there were means by which it could have been taken up to the top from the deposits below, it very probably was weathered out of the basalt, together with the pleonaste with which it was found. The mineral inclusions in the basalt on the tops of the mountains present many interesting features, and are regarded as throwing some light on the origin of sapphires, although it must apparently remain largely speculative. In the different workings on the Anakie field the thickness of the sapphire wash varies considerably, in some places being only a few inches thick, while in others it amounts to several feet.

The bottom is usually a reddish clay, resting on decomposed schists and slates. Occasionally this reddish clay has been mistaken for the bottom, but such is not the case, other and sometimes richer beds having occasionally been found below it. Some of the workings contain only medium sized boulders, while others have boulders too large to be removed by hand. Frequently the sapphire wash is extremely clayey, and requires "puddling" before the gems can be extracted. Much, however, of the wash is loose, friable, and free from clay, in which case the sapphires are obtained by "dry sieving." No general rule can be given to determine what the deposits will be like in any particular place. In a claim the wash may change from a reddish clay to a very dark, fine, friable soil, or from a black soil to one which is white and marly, all carrying sapphires; and from being a shallow surface deposit to one perhaps seven or eight feet deep. In several of the western creeks the wash is of considerable thickness, and in a few of the deposits, so far, no bottom has been found, the wash not being sufficiently rich to induce miners to sink beyond a few feet. That part of the wash which carries the sapphires is often very irregular, sometimes occurring as small patches in the otherwise almost barren portions; while in other places the sapphires are generally scattered throughout the wash. As the older formations which form the bottom of the deposits vary in composition, so does the color of the deposits which rest on them. Where the bedrock consists of decomposed slates and schists, the wash is inclined to be reddish; where granite is present, the wash is yellowish; and where the basic volcanic and intrusive rocks are on the bottom the wash is almost black. The blue stones are most numerous on the eastern fields of the district, and the green ones on the western fields, while the parti-colored stones are common to both. Yellow sapphires are extremely rare. Shades of blue range from light to dark, but the rich cobalt-blue color—the cornflower blue—has yet to be found. The green shades vary from a light-tinted pale green to a deep olivine green. The light green stones having a just perceptible golden tinge are very beautiful, and according to Dr. Dunstan, might be appropriately termed "Oriental chrysoberyl," while the pure green would be "Oriental peridot." Some fine specimens of the Oriental topaz, both of canary and orange yellow shades, have been obtained, but the "Oriental ruby," the red variety, is extremely rare, the one or two found being of perfect color. The purple-tinted stone, "Oriental amethyst," is also rare, but when found has the true amethyst color.

With the sapphires in the alluvial deposits the hyacinth, a well known variety of zircon, is frequently found, mostly in the shape of small grains, of shades varying from brown to deep blood-red, the stones suitable for cutting as gems being comparatively rare. Some of the colorless hyacinths have a resemblance to rough diamonds, and have been mistaken as such. They have rounded faces, are brightly polished, and possess a brilliant luster, but are betrayed by their inferior hardness. In some of its richer shades the hyacinth is extremely beautiful, and, although softer than the sapphire, is harder than opal, the much prized Australian gemstone. Several of the stones have the property of altering their color. Occasionally miners who have carried stones in their pockets have found the color affected by the warmth of the body. When heated the stone becomes lighter in color or changes from red to brown. Intense heat will destroy all the color. When only slightly heated the stone, as it becomes cool, resumes its natural tint. The same effect is obtainable with sunlight. The sapphire wash-dirt is, as already hinted, treated in a somewhat primitive yet very effectual manner by means of sieves of peculiar construction, which save even the smallest stones.

Working a Sapphire Deposit.

AUSTRALIAN SAPPHIRES.

A correspondent of the New York Times writes the following interesting letter to that publication on a school for airship experimenters:

"The benevolence of philanthropists has been, up to this time, mainly directed to libraries, schools, universities, and other institutions of learning. There are manual training and technical schools, but there are no institutions where untold numbers of capable and practical men, especially workingmen, can be advised and financially helped. Frequently such men have to give up the pursuit of ingenious inventions for lack of means to perfect them. Applied science would certainly be much promoted if inventors were given the opportunity to work out their inventions to a degree of commercial utility, which otherwise they could not afford to do.

"If we look at the field to which so many now turn their energies and money, air navigation, it appears as if they were tying the cart before the horse. Instead of advancing on a sure, scientific, and practical basis, they waste money on balloons, which lack the first requirement, dirigibility. Would it not be more sensible to recognize the immature state of the science of air navigation and to first exhaust all resources by offering prizes to scientific and practical men for valuable propositions to overcome the principal obstacle, resistance of the air? Until this problem is solved balloons will remain mere toys.

"If there existed an institution in which ideas, patterns, or developed models could be examined and where the inventor would be allowed to finish and test his invention and to demonstrate its commercial value, there would certainly be more chances to accomplish quicker and better results.

"Suppose one or more such institutions should be created, does it not stand to reason that in a given time such institutions would be self-supporting? The inventors, in case of success, would only be too willing to divide their revenues from such institutions with the institution that enabled them to finally reach success."

For several weeks during the drought from which a portion of central southern Florida has been suffering for a long time, heavy fogs were of frequent occurrence. The amount of water that these yielded was determined by the Rollins College weather observer by supporting a weighted sheet of filter paper near the ground during the night, and allowing it to remain carefully protected from the sunshine until the dissipation of the fog in the early morning, and then weighing the saturated paper. It was found that a very dense southern Florida fog is not equivalent to more than 0.002 of an inch of precipitation as measured by a rain gage.

The use of nitrogen gas has been tried in France for inflating tires.

A GIGANTIC CLOCK.

BY DR. ALFRED GRADENWITZ.

Few mechanisms exert the same fascination on the human mind as a clock. This instrument, measuring the most important factor of modern life, time, is in fact the most indispensable utensil of our activity. This explains why from the very earliest times of the watchmaking art some especially skilled constructors should have devoted so much attention and energy to the production of real marvel clocks. These endeavors to outdo one another by the construction of ever more complicated clocks have been continued to modern times. An interesting example is afforded by the clock that has been recently installed in the bell tower of the St. Gervais basilica at Avranches (France) and of which a short description is given in the following. The clock was constructed by Mr. Gourdin at Mayet (Sarthe) and claims to be the largest in France.

It comprises five works, viz., a regulating works and four striking works. The former, which is provided with a remontoir escapement, regulates and disengages the striking works; by means of hollow steel rods 38 m. (124 ft.) in total length, and 6 gear trains it actuates 7 dials, viz., 4 external dials 1.4 m. (4.6 ft.) in diameter, and 3 internal dials of smaller dimensions. The regulating works at the same time operate a large bronze wheel upward of 1 meter in diameter, carrying 96 pins, each of which corresponds to a quarter of an hour, and by the aid of which the various ringing effects are produced automatically.

These ringing effects are obtained by means of four clockworks, one of which serves for the hours, one for the quarters, and the two remaining for the several chimes, which are the following: The quarters ringing works will play the hymn "Inviolata," the first 5 notes being produced at the first quarter, further 8 notes with the second, and 11 notes with the third quarter, while with the fourth quarter, before the hour is rung, the whole phrase, "Inviolata, integra et casta es Maria," is heard.

At noon and at 7 o'clock in the evening the "Inviolata" is automatically replaced by some tune varying according to the season.

The hours are rung by means of a hammer 100 kgs. (220 lbs.) in weight on a bell weighing 6,454 kgs. (14,228 lbs.), the working weight of this clockwork being only 300 kgs. (661 lbs.) Another 22 bells representing a chromatical scale and varying from 33 to 2,230 kgs. (4,916 lbs.) in weight, has been provided for ringing the quarters and operating the chimes. The most remarkable feature of the latter is that the number of tunes is increased at will, the cylinders on which the cams of the hammers are located being readily exchanged, like those of a phonograph, provided the tunes in question fit into the series of notes represented by the 23 bells. The large cylinder visible in Fig. 1 to the right carries the cams, gearing with the ends of the bell hammers by means of the levers lifted by their aid. Each bell has been provided with two hammers, the weights of which, according to their size, vary from 6 to 20 kgs. (13 to 44 lbs.).

The dials of the clock are of ordinary dimensions, only the power and automatic operation of the ringing mechanisms as well as the weight of the hour's hammer (100 kgs.) being remarkable.

The aggregate weight of the whole clockwork is 2,000 kgs. (4,409 lbs.), its length being 4.15 m. (13.6 ft.), its breadth 1.90 m. (6.2 ft.), and its height 2.40 m. (7.8 ft.). The wheels of the ringing works are 0.60 m. (23.6 in.) in diameter.

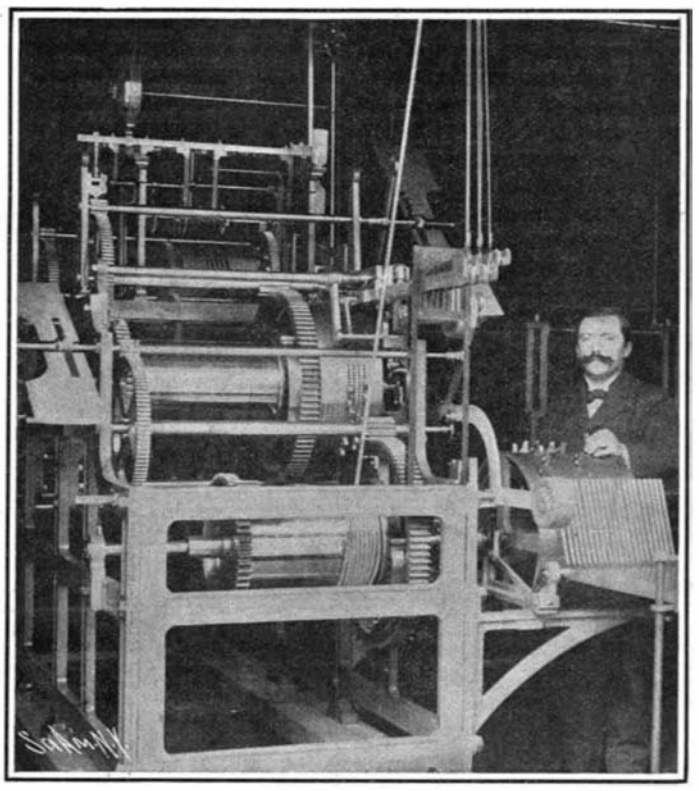


Fig. 1.—End View of Mechanism.

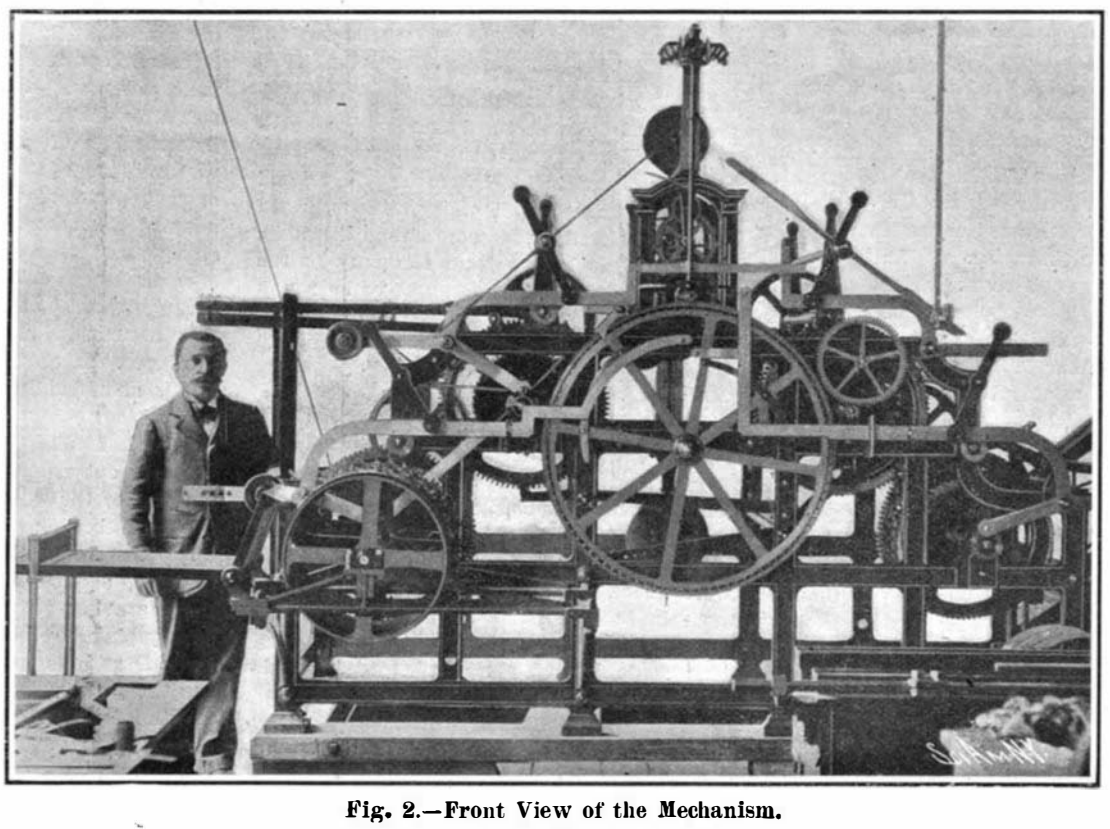


Fig. 2.—Front View of the Mechanism.

A GIGANTIC CLOCK.

A professor at Lehigh University has made a calculation to show that if a tiny vessel of one cu. cm. (0.061 cu. in.) capacity is filled with hydrogen corpuscles there can be placed therein, in round numbers, five hundred and twenty-five octillions—525,000,000,000,000,000,000,000,000—of them. If these corpuscles are allowed to run out of the vessel at the rate of one thousand per second it will require seventeen quintillions—17,000,000,000,000,000,000—of years to empty it. We leave it to our readers to calculate how long the filling process will require.

Vanadium Steel in Automobile Manufacture.

Automobile construction has put steel makers to a severe test. To obtain strength, durability, and elasticity and yet to reduce weight are problems of no mean order. Many experiments and tests are necessary to get the best results.

Preparing metals for automobile construction requires entirely different methods from those for other engineering specifications. Steels that under ordinary circumstances would stand the usual static tests, would prove unavailable if tried under the severe dynamic strains to which they would be exposed. J. Kent Smith, the English metallurgist and exponent of vanadium, in an address to the Mechanical Branch of the Association of Licensed Automobile Manufacturers, stated that from 80 to 90 per cent of the breakages were caused by dynamic strains to the metal, leaving only 10 or 15 per cent as the result of the static. It has been the aim of each engineer to discover the best grades of steel for each specific part of an automobile, which would withstand the particular dynamic strain to which it would be subjected.

In vanadium there seem to be found all the elements to give the desired requirements. Vanadium is peculiar in that unlike many other metals it has no value in itself, but when alloyed with steel has infinite capabilities. Vanadium has long been known. It is found in small quantities in Swedish ore, but in such small quantities that its use was prohibitive.

The addition of vanadium to various steels has overcome in many ways the difficulties that have presented themselves in dynamic forms to the specific duties of certain grades of metals. It is a most elusive element, and its presence is not always known. If there is any oxide left in steel, it will be cleaned out by the vanadium. To use it as an agent for this work, however, is very expensive. An analysis of a steel known to contain vanadium will not always result in the finding of a percentage that has been put in, although tests will show its presence in certain degrees. For example, it may be known that 15 per cent has been put in an open-hearth casting, whereas the analysis will show but 4 per cent. This is because its introduction is improper. It is quite useless to introduce vanadium in oxidized steel because you cannot find any vanadium in the steel. It naturally did its easiest work first, seizing the oxygen, so that the steel did not receive the dynamic qualities of the element. Its work was confined to cleansing.

Unlike many other elements, vanadium, to get the best results, must be used in extremely small quantities. A little goes a great way, too much being as useless as not enough. For casehardened steel from 1½ to 2 per cent remaining in the steel will give better results than a less amount, although even if properly introduced 10 per cent of the amount put in, that is, 10 per cent of the 2 per cent, must be counted as a loss.

In some instances steel makers have directed their efforts to attaining a satisfactory tensile strength, which is of course necessary, but in many cases the tensile strength has been increased to the detriment of the dynamic qualities of the metal, and this often without needing the maximum tensile strength for some specific duty of the steel. With the addition of vanadium the same tensile strength may be maintained or even lowered with the dynamic qualities increased, but for certain conditions the dynamic qualities would not be necessary. This would apply to the parts of an automobile where a steady and consistent strain is maintained.

Bending tests by Prof. Arnold have shown that vanadium steel will stand a much higher alternating stress test than steels containing any of the other alloys. A high carbon may break at 100 alternations. Steels of the best acid or open-hearth casting will run as high as 290. An excellent quality of nickel steel ran to 270, while vanadium steel has attained as high as 570, or nearly 100 per cent better than a good nickel compound.

The life of steels, pure carbon steels, is materially lengthened by the addition of this alloy. A pure carbon steel on test ran to 280; the same after the addition of vanadium ran to 480. The simple addition of vanadium to a low-carbon steel raises its tensile strength or the elastic limit of the steel. In regard to nickel steel, vanadium does not increase the life of the steel when tested beyond its elastic limit. Where the dynamic qualities enter into the duties of a metal, it has been found that the intensifying of chrome by vanadium has given the most satisfactory results. Where the requirements are more static than dynamic, or an equal proportion of both, vanadium nickel has proven to be the better.

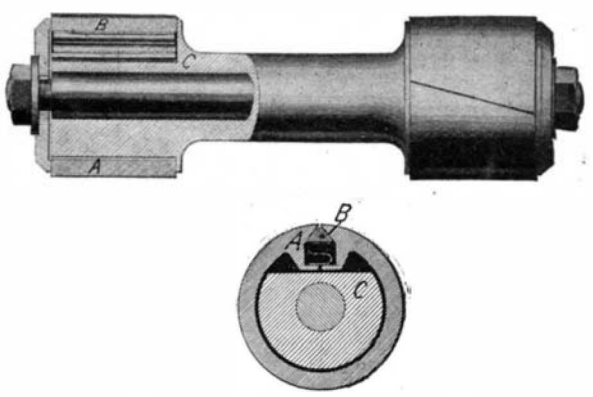
The principal parts of an automobile that are constantly receiving the sudden or unexpected shock or strain will be most benefited by vanadium steel or vanadium chrome. Axles, springs, frames, crankshafts, and gears should be specifically adapted to the dynamic conditions imposed upon them. In casehardened gears, tests have proven that vanadium chrome has been used to great advantage.

Vanadium has proven a most satisfactory alloy because it works so generally. It works in more than one direction, but these directions can be directed to get the maximum results if properly handled. It has an advantage in that it machines nicely. Vanadium chrome machines almost like a carbon steel. There is no apparent difference in machining a carbon axle and a chrome-nickel axle. A vanadium chrome shaft is a little stiffer to machine than an ordinary carbon crankshaft, but it is no more difficult than an ordinary nickel crankshaft, and not as hard to machine as a nickel-chrome would be. In forging it is the same way, not being more troublesome than a plain nickel steel. On the whole, the introduction of vanadium steels for particular parts of automobile construction has been accompanied by the most satisfactory results. It has been conceded that chrome vanadium steel is the finest steel ever used for building moving machinery.

Patent Department

IMPROVED PACKING FOR PISTONS.

Pictured in the accompanying engraving is a new form of packing adapted for use on pistons and the like. The illustration shows the packing applied to a steam-pump piston. The packing ring *A* is loosely fitted on the body *C* of the piston, and the inner edge of the ring bears against a shoulder formed thereon. The

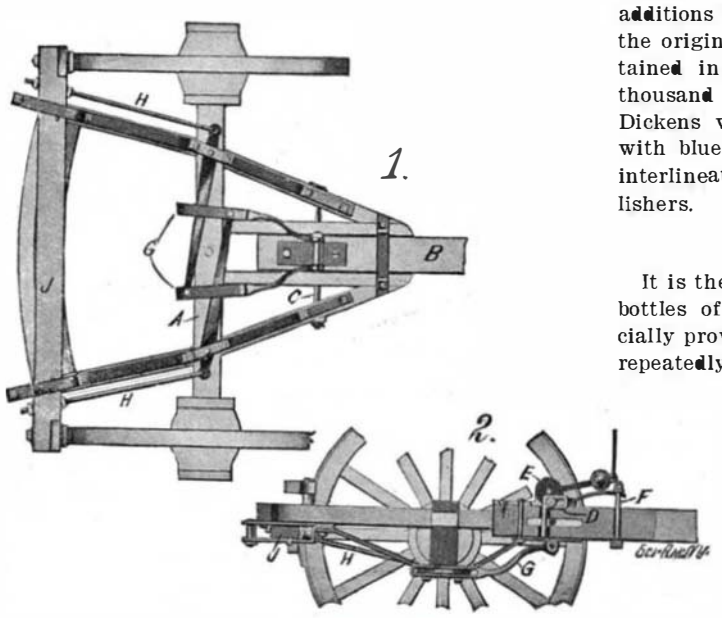


IMPROVED PACKING FOR PISTONS.

ring *A* is retained by a washer, which bears against its outer edge, the washer being held in place by a nut screwed on the outer end of the central piston rod. The packing ring *A* is split, being formed with beveled end walls adapted to engage a spreader bar *B*, of triangular cross section. This spreader bar is engaged and pressed outward by a spring *G* of S-shape, which is held on a seat formed integrally on the inside of the packing ring *A*. Instead of the S-shaped spring, liners or like devices may be employed for forcing the spreader bar *B* outward, with a view to opening the split ring, so as to firmly engage the inner surface of the cylinder in which the piston is used. It will be evident that the outer surface of the ring snugly fits the inner surface of the cylinder in which the piston is used, the ring being spread apart with sufficient force by the spreader bar *F*, so as to prevent all leakage from one side of the piston to the other. The ring is preferably made of steel, while the spreader bar is made of softer metal, such as brass, so as to prevent the outer corner of the spreader bar from cutting into the surface of the cylinder. A patent on this improved packing has been granted to Mr. Stewart Holmes, 357 Douglas Street, Brooklyn, N. Y.

WAGON BRAKE.

The accompanying engraving illustrates a novel form of brake adapted for use on wagons which carry heavy loads. The brake is so arranged that it may be set to operate automatically when the wagon is traveling downhill. In our illustration Fig. 1 shows the under side of the fore truck, while Fig. 2 shows a longitudinal section through the brake mechanism. The axle is indicated at *A*, and this is provided with the usual hounds supporting guide bars between which the tongue *B* is fitted. A transverse bar *C* passes through the hounds and guide bars and also through a slot in the tongue *B*. A bolt *D* in the tongue *B* passes vertically through the slot therein, to the rear of the bar *C*, so that as the vehicle is drawn forward, the strain is borne by the bolt *D* bearing on the bar *C*. The upper end of the bolt *D* is provided with a lateral extension in which a slot is formed. This slot is engaged by a pin mounted eccentrically upon a disk *E*, which is journaled in bearings on the tongue. A king bolt *F* provides means for securing a draft tree to the pole. Secured to the under side of the tongue *B* are a pair of links *G* formed with slotted rear ends. Connected to these links *G*, and fulcrumed to the axle *A*, in the manner indicated in Fig. 1, are a pair of levers, which are connected by the rods *H* with the brake beam *J*. The latter is mounted to slide in bearings formed on the hounds, and is provided with the usual brake shoes adapted to bear against the wheels. In use, when the vehicle is traveling downhill, it moves forward on the tongue *B*, thus swinging the levers connected to the arms *G* and drawing the brake shoes into contact with the wheels. If it be desired to disconnect the brake the driver swings the disk *E* on its journals by lifting a cord connected to the end of a weighted lever formed on the disk, and then after the tongue has been drawn forward on the transverse bar the bolt *D* is slipped down in front of the bar *C*, preventing the play in the slot necessary for the operation of the brakes. A patent on this improved wagon brake has recently been secured by Mr. George F. Young, of South Kortright, N. Y.



WAGON BRAKE.

An Exhibition of Inventions.

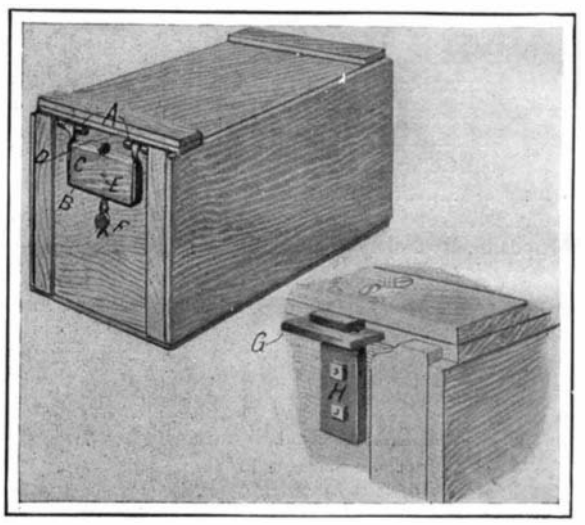
A most interesting feature of the Jamestown Exposition which has just opened will be the "Section for Inventions," in which inventors are invited to display their inventions and demonstrate their value to visitors. The invitation is open to all, and every facility is offered in the way of floor space, tables, and shelves, advertising cards and labels, electric current, gas, lights, etc. A modest fee of from ten to not more than thirty dollars, except in very special cases, is charged for such space and service. The service includes as well the general care of models, explanation to visitors, and the return of the exhibit at the close of the Exposition. Awards will be made of gold, silver, and bronze medals and diplomas. That inventors are alive to this unparalleled opportunity for making public their creations is shown by the fact that within four weeks after the first notice was sent out by the Bureau of Inventions of the Jamestown Exposition, applications had been made for more than 5,000 square feet, and new applications are now coming at the rate of a hundred a day. The inventors are not the only ones who will profit by this display, for the exhibition cannot fail to be of interest and material benefit to the public at large. Never before has such an opportunity been presented at any exposition, and now that the first step has been made in this direction such exhibitions of inventions will no doubt become a part of all future expositions.

The Handwriting of Authors.

An interesting study is the handwriting of authors, as it indicates to a greater or less degree their personal temperaments. Longfellow wrote a bold, open back hand, which was the delight of printers. Joaquin Miller writes such a bad hand that he often becomes puzzled over his own work, and the printer sings the praises of the inventor of the typewriter. Charlotte Bronte's writing seemed to have been traced with a cambric needle, and Thackeray's writing, while marvelously neat and precise, was so small that the best of eyes were needed to read it. Likewise the handwriting of Capt. Marryat was so microscopic that when he was interrupted in his labors he was obliged to mark the place where he left off by sticking a pin in the paper. Napoleon's was worse than illegible, and it is said that his letters from Germany to the Empress Josephine were at first thought to be rough maps of the seat of war. Carlyle wrote a patient, crabbed, and oddly emphasized hand. The penmanship of Bryant was aggressive, well formed, and decidedly pleasing to the eye; while the chirography of Scott, Hunt, Moore, and Gray was smooth and easy to read, but did not express any distinct individuality. Byron's handwriting was nothing more than a scrawl. His additions to his proofs frequently exceeded in volume the original copy, and in one of his poems, which contained in the original only four hundred lines, one thousand were added in the proofs. The writing of Dickens was minute, and he had a habit of writing with blue ink on blue paper. Frequent erasures and interlineations made his copy a burden to his publishers.

SEAL BOX FASTENER.

It is the custom to ship heavy objects, such as large bottles of mineral water and the like, in boxes specially provided for the purpose, and to use such boxes repeatedly until they are worn out. Ordinarily, the lid is nailed on the box, and the repeated nailing soon renders the box useless for further shipment. To obviate such difficulties, Mr. Clarence A. Schaad, of 846 South Tenth Street, San José, Cal., has invented a fastener by means of which a lid may be secured to a box without nailing. The fastener is so designed that a seal of lead or like material may be applied thereto, to prevent tampering with the contents of the box *en route*. As shown in the accompanying engraving, the lid of Mr. Schaad's box has hinged thereto at *A* a U-shaped strap, or bail *B*. Secured to the front of the box is a block *C*, over which the bail is adapted to be fitted. In this position it is held by a bolt *D*, which passes through the block and the bail. The bolt is formed with a slot near the center, and a pin or screw *E* in the block passes transversely through the slot to retain the bolt. A leaden seal *F* may be secured to the

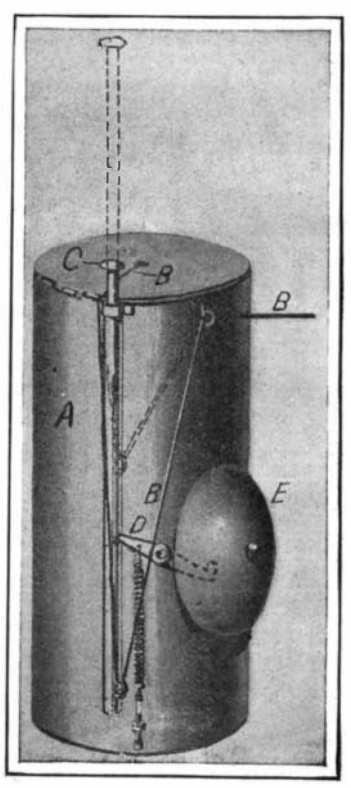


SEAL BOX FASTENER.

lower end of the bolt. The hinge at the rear of the box consists of two slotted plates *G* secured to the lid, and two straps *H* fastened to the body of the box. The straps are formed with hook ends adapted to enter the slots in the plates. By this arrangement the lid may be entirely removed from the box when the latter is opened. At the same time it requires a very strong hinge, which is necessary because in packing such boxes it is customary to use a quantity of excelsior or shavings, which must be pressed down with considerable force when applying the lid. The box may be used to advantage in shipping eggs, fruit, etc., as well as heavier articles, such as bottles, jugs, and the like.

ALARM ATTACHMENT FOR SELF-BINDERS.

Considerable trouble is experienced in the operation of self-binding harvesters, due to the tangling or knotting of the twine, and its consequent breaking. To overcome this difficulty a recent patent provides an alarm device which, in case of improper feeding of the twine, will give a signal to the driver in time to have him stop the machine before the twine is broken, and thus save the delay and inconvenience which would otherwise be entailed in rethreading the mechanism. The accompanying engraving illustrates the alarm device. The twine is held in a receptacle *A*, and passes out through an opening in the top. Thence the twine *B* is led down over the side, and threaded through an eye carried at the bottom of a rod *C*. From this point it is led back through an eye at the top of the receptacle, and thence to the mechanism of the binder. The rod *C* is mounted to slide vertically in a slideway. Intermediate of its length it is provided with a pin, which bears against one arm of the lever *D*. The opposite arm of this lever carries a hammer head adapted to strike the gong *E* when it is released from engagement with the pin on the rod, the striking being effected by a coil spring, which exerts a tension on the lever. In operation, should the twine become knotted and feed improperly out of the receptacle, the rod *C* would be lifted up to the dotted position, shown in the engraving, thus disengaging the lever *D* and sounding the gong. The length of twine *B*, extending down to the bottom of rod *D* and back again, is such that the operator would have time to stop the machine before the twine would break. A patent on this novel attachment has been granted to Mr. Lewis J. Phillips, of Foss, Oklahoma Territory.



ALARM ATTACHMENT FOR SELF-BINDERS.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TELEGRAPHONE. — G. MORIN, Habana, Cuba. This invention relates to telegraphones, and more particularly to apparatus for enabling the so-called "voice-currents" to be generated in a wire or line by means of a magneto member having the form of a disk. The improvement further relates to means for enabling one or both sides of the disk to be used as desired.

Of Interest to Farmers.

COMBINED POTATO-DIGGER AND COTTON-CHOPPER.—R. KRAUSE, Swanquarter, N. C. The digging mechanism comprises a frame having the main bars turned spirally to form approximately a screw, which would if moved in the direction of its axis through a resisting medium, be caused to turn in one direction or the other, according to the spiral twist of the frame-bars. Means provide for turning the frame in a reverse direction. A hoe comprises a shank and a horizontal blade, which when the machine is used as a cotton chopper takes the place of the blades. The hoe passing into the ground cuts out the cotton-plants at predetermined intervals.

DISK-HARROW SCRAPER.—A. C. GAYLORD, Galesburg, Ill. The invention relates to certain improvements in disk-harrow scrapers in which the scraper-blades are held in contact with the disk by the pressure of springs, the object of the inventor being to relieve the pressure, and hence lessen the friction or increased draft load at the will of the operator.

FRUIT-PICKER'S BASKET.—F. CARTMEL, Jacksonville, Fla. The object of the invention is to provide a basket arranged to permit the picker to conveniently empty the basket of its contents without danger of bruising or otherwise injuring the fruit and without requiring removal of the basket from the picker, the basket being collapsible, and when collapsed is convenient for storing, handling, and shipping of empty baskets.

CULTIVATOR ATTACHMENT.—J. J. YOUNG, Denver, Col. The purpose in this invention is to provide an attachment adapted for convenient adjustment of the fenders employed on corn-cultivators and cultivators of like type to protect the young plants during cultivation, and to so construct the attachment that it may be applied to the beam of any cultivator and so that the said fenders can be expeditiously and quickly adjusted up or down on the arc of a circle as may be demanded and be held firmly in adjusted position.

COLTER-BEARING.—T. R. WALLIS, Greenville, Miss. The object of the improvement is to provide a bearing which will mount the metal hub of the colter-blade on a steel or other metal bearing and by means of which, however, the bearing is supported firmly and non-rotatively on the frame of the plow or other agricultural implement.

SHEEP-BRANDING MACHINE. — J. A. MAGELSSEN, Melville, Mont. The object in this improvement is to provide a device in which the printing or painting mechanism will be automatically supplied with liquid coloring material in such manner that a large number of sheep may be easily and quickly marked for identification by simply applying the device to the part for an instant and causing neither pain nor annoyance.

Of General Interest.

LOOSE-LEAF BINDER.—H. G. BUCHAN, Woodbridge, N. J. One purpose of the inventor is to provide a binder with a sectional segmental back of spring material so constructed that it may be employed for binding one or as many sheets as may be desired to the extent of its expansion, which is limited only by the number of sheets it will hold when opened to its fullest extent.

BOAT.—U. R. MILLER, Salem, Ohio. In this case, means are adapted to increase speed, decrease draft, and maintain stability. In operation a boat has a tendency to ride out of water when moving at high speed, thereby decreasing the draft and causing the boat to ride on the surface instead of crowding its way through the water. Although the draft is thereby decreased, the keel, together with the flat inclined planes, provide ample stability to the boat even when the planes are riding on the water.

THAWING-POINT.—F. LEWIS, Fairbanks, District of Alaska. In using the device in gold-mining operations the point is driven into the frozen earth by means of a sledge or hammer, and steam is allowed to pass into the interior of the point. This steam, which escapes at the point, thaws the frozen ground and enables the device to be driven further in. An advantageous feature is the fact that there is no necessity for welding the parts together.

PROCESS OF PURIFYING ACETYLENE GAS.—G. F. JAUBERT, 155 Boulevard Malesherbes, Paris, France. The object in this instance is to provide a process for eliminating from acetylene gas the phosphureted hydrogen, which, as is known, constitutes the impurity which is the most undesirable and at the same time the most difficult to eliminate. The gas as soon as formed is passed into washing-tanks which contain sulfuric acid concentrated at 62 deg. to 64 deg. Baumé, saturated with any appropriate arsenic derivative.

HORSESHOE.—H. DAHMS, Berlin, Germany. The object of the invention is to provide a calk form which will be secured in the horseshoe by improved means. The special object is to provide a construction which will insure that the calk will remain tight during its period of usefulness, but which will enable the calk to be readily removed when it is to be replaced by another.

STRAIN-EQUALIZER.—J. W. WASH, Lawrenceburg, Ky. The device is characterized by the fact that the pull on various numbers of wires or cables, as in stringing fence, telephone, or telegraph wires may be equalized. This is done by an endless rope bent over a series of pulleys on a draft-bar, forming loops each of which is provided with a block, and when less than the full number of wires are connected the idle blocks will pull up the bar, leaving the other under equal strain.

BEER-TAPPER.—R. B. SPIKES, Bisbee, Ariz. Ter. In this instance the invention has reference to devices known as beer-tappers, which are in the nature of appliances for opening and dispensing beer from the keg or barrel. Such devices have hitherto been employed which simultaneously opened an outlet for beer and an inlet for air.

KILN.—J. A. SHUMAKER, Hyndman, Pa. The object of the inventor is to provide improvements, specially in connection with the fire-box, whereby one part of the fire only may be maintained, while the other portion of the fire-box may be cleaned. By this construction a great saving in the volume of heat for the kiln is accomplished at all times, as well as the stopping of the volume of cold air entering the kiln which latter is very detrimental to the hot brick.

TELESCOPE FOR SUBMARINE BOATS.—F. REHM, Lichtenfels, and K. WINDSTOSSER, Nuremberg, Germany. In this patent the invention has reference to a telescope for submarine boats by means of which the several fields of view representing several parts of the horizon or sea are obtained within one and the same circle, the several fields of view being preferably so arranged that the field of view of the fore part of the horizon or sea is made the chief field and larger than the other fields of view.

CANT-HOOK OR PEAVEY.—P. PRICE, Panther, W. Va. This hook or peavey is such as is used in logging camps for moving or guidings logs from place to place. The object of the invention is to produce a hook of a construction which operates to increase the strength of the stock or handle and which will prevent dislocation of the point or socket of the hook.

METHOD OF RAISING LIQUIDS FROM WELLS.—F. J. MOSER, Kane, Pa. This invention pertains to a method of raising liquids from wells, and admits of general use, but is of peculiar service in connection with the raising of liquids from oil-wells. The invention may be considered in connection with Patents Nos. 721594 and 751323. The present invention undertakes to improve upon the methods disclosed in the patents above mentioned.

APPARATUS FOR SHARPENING LAWN-MOWERS.—E. C. SPRINGER, Mason City, Iowa. The principal purpose of the invention is to improve upon the device designed for the same purpose for which Letters Patent of the United States were formerly granted to Mr. Springer, to the extent that the device is rendered more simple and it is not needful to remove the wheels or change the gearing before placing a mower upon the device, it being necessary only to turn the mower upside down and clamp it in position upon the device, whereupon the wheels may be revolved through the medium of a clamp-handle especially adapted for the purpose.

CHALK-LINE HOLDER.—M. A. REARE, Los Angeles, Cal. This invention pertains to cord-holders such as used in holding marking-cords, such as chalk-lines. One object is to produce a device of this kind which will operate normally to maintain the cord wound within the device, but which will enable the cord to be drawn out when it is to be used.

Hardware.

SOD OR WALK TRIMMER.—D. L. ROSE, Mankato, Minn. This trimmer is designed especially for trimming sod from along a sidewalk, such as cement sidewalks, but which can also be used to advantage in trimming sod along flower-beds and the like. The tool when moved along the sidewalk will trim the sod and by the inner inclined face of the guide-gage throw all dirt and the like beyond the excavation formed by the cutters.

HAMMER.—H. LEWIS, New York, N. Y. This invention has reference to improvements in hammers chiefly applicable to silversmiths' work; and its primary object is to provide a hammer that will to a greater degree be accessible to obstructed parts. In this instance the head of the hammer is pivotally mounted near its rear end to the handle and can be adjusted to any angle with respect to the handle as may be most convenient by turning a thumb-piece located at the free end of the handle.

DOOR STOP AND LOCK.—C. J. TATUM, Port Arthur, Texas. A plate on the spindle when released operates as a guide for the upper end of the rod as the latter is raised by the key and also serves to maintain the upper end of the rod in convenient position for the engagement of its abutment by the key when inserted through the hole. As knobs are usually spring-actuated by means of the ordinary devices connected therewith, it will be understood that such knob-springs will aid the spring in pressing the cushion-block into engagement with the floor-surface.

Household Utilities.

CASTER.—W. IMBT, East Stroudsburg, Pa. The invention is an improvement in casters as used in supporting furniture to enable it to be easily rolled about. The object of the inventor is to provide a form of caster which shall be strong and durable, not likely to get out of order, and one which shall be absolutely noiseless and of free working.

BROILER.—J. W. ROSS, Chillicothe, Mo. This broiler is adapted for broiling meat, fish, game, etc. In operation the broiler can be placed on any fire-box or surface and, if desired, can be used under any suitable form of hood and can be used on the top of a range or other heated surface and be made of any size and thickness to suit particular purposes.

Machines and Mechanical Devices.

MACHINE FOR CUTTING MEAT.—I. B. VAN SISE, Oyster Bay, N. Y. One purpose in this improvement is to provide a machine for cutting meat, especially sausage-meat, and to so construct the machine that the feed will be intermittent, supplying the cutter at each movement of the feed with just sufficient material for the knives to properly handle.

SHOE-SEWING MACHINE.—J. A. RHOULT, Haverhill, Mass. The present invention simplifies and improves the means for carrying the thread. It improves the stitch-forming devices and provides means for firmly holding the sole during stitching operation and for releasing the sole during feeding movement. It simplifies and renders more certain of operation the devices for threading the thread-carrier and stitch-forming elements; and adapts the machine to sewing felt or other fabric uppers to the soles by providing means for gripping and feeding the felt upper, as well as the sole.

ATTACHMENT FOR TURNING-LATHES.—J. MORGAN, Hughesville, Pa. The invention refers to lathes for metal or wood work, and is especially useful in boring and centering or as a center rest. The object is to provide a durable lathe, steady-rest or chuck which is easily operated manually, which may be attached without difficulty to lathes of the usual construction and which will afford means for holding or steadying the material or work.

DITCHING-PLOW.—C. T. HOWELL, Kirkman, Iowa. One purpose of the invention is to provide a construction of plow for digging tiling-sewer ditches or draining-ditches and which is light of draft and capable of effective service in any character of soil. Another is to construct a plow with an inclined conductor from the gutter to wings that move over the surface of the ground and remove excavated material from the edges of the ditch. It is adapted to be drawn by a traction-engine.

STEAM-SAWYER.—S. V. ABREGO, Lake Charles, La. In this patent the invention pertains to improvements in devices for controlling the valves of a steam-feed for sawmill-carriages, the object being to provide a steam-actuating mechanism for shifting the valves, thus relieving an attendant or sawyer from a greater part of the work now required to shift the valves manually.

CALCINING-FURNACE.—T. MCNEAL, Kansas City, Mo. The general construction of this furnace is similar to that shown in the patent formerly granted to Mr. McNeal. The improvement is particularly in scrapers or agitators used in apparatus for calcining plaster and like material, an object being to so construct the scraper that it will engage closely with all parts of the convex bottom of the calcining vessel, thus thoroughly stirring the material.

Prime Movers and Their Accessories.

ROTARY ENGINE.—P. O. POULSON, Brigham, Utah. The invention relates to improvements in rotary engines adapted for use in connection with any suitable motive fluid—as, for instance, steam, compressed air, water, and the like. The object is to provide means for moving the abutments from the chamber as the piston passes and also certain improvements in means for suppyling the motive fluid adjacent said abutments for operating the device.

Railways and Their Accessories.

SWITCH.—J. T. SALVO, Charleston, S. C. The object of this invention is the provision of means simple and inexpensive in construction, durable in operation, and effective in use, adapted to be readily operated by a passing car and so constructed as to be operative in any locality with little or no liability to become inoperative from any cause.

CAR JOURNAL-BOX.—A. V. PEPPARD, San Luis Potosi, Mexico. An object of this inventor is to so construct the keeper-bolts that when the pressure of the car is downward and forward on the box the tendency of the liner and shoe or wedge will be to draw the bolts down and at the same time the liner will lock the bolts in lower position, and also to provide a construction of spring for each of the bolts, which springs act, first, to hold the bolts in lower or positive position, and, second, to sustain the bolts in their upper or inactive position. It is an improvement upon the box for which Letters Patent were formerly granted to Mr. Peppard.

DUST-GUARD.—H. BENSCH, Davenport, Iowa. By this invention Mr. Bensch seeks to provide a guard which can be readily inserted in any of the ordinary journal-boxes now in general use and which will comprise a series of radially movable packing-blocks with the spring embracing the series and adapted to exert an inward tension on the several blocks, the blocks being movably held in suitable guides on a carrier-plate.

Pertaining to Vehicles.

AXLE.—G. A. WEAVER, Newport, R. I. While this invention is capable of use with all vehicles, it is especially useful in automobile construction. The object is to provide an arrangement for mounting the wheels upon the frame, which will enable the direction of the wheels to be easily controlled. A further object is to provide a strong axle construction which will dispense with the usual steering-knuckle and its accessories.

TRANSMISSION MECHANISM.—G. A. WEAVER, Newport, R. I. This mechanism is especially adapted for application to automobiles. The inventor provides means whereby two engines can be coupled up, so as to simultaneously transmit power at varying rates of speed to a driven shaft; provides for driving a shaft and the other engine or motor by one of the engines or motors in case of breakage, and also provides an efficient means for transmitting the power when the speed is to be varied.

VEHICLE-FRAME.—O. STOLP, New York, N. Y. In this patent the invention is an improvement in frames for vehicles, especially of the automobile type, and has among other objects the production of a spring arrangement in the frame whereby little shock or vibration is experienced in passing over rough roads and other uneven surfaces.

MOTOR-VEHICLE.—M. H. MAGIE and C. N. WINTERS, Bakersfield, Cal. The underlying purpose here is to provide a vehicle in which the motive power, braking force, and steering action may be applied to all of the four road-wheels of the vehicle. This construction gives greater power of traction, prevents skidding, and enables the vehicle to be completely controlled.

REIN-GUARD.—W. P. FELL, Huron, S. D. The design in this case is to prevent the reins from becoming caught or entangled with the wagon-pole. The object of the invention is to provide a device of this character at a very small cost which will be simple and durable and which may be quickly and easily applied to various sizes and types of wagons.

Designs.

DESIGN FOR A WALL-COVERING.—L. PRONBERGER, Berlin, Germany. Mr. Pronberger has secured patents on seven separate designs of wall-covering. They are numbered from 38,517 to 38,523 inclusive. Ornamental value of a wide and varied artistic range marks the designs. Only one of the number departs from the perpendicular band style of running the patterns. All bear the characteristic of ornate invention within lines of refinement and are calculated to attract by their distinct originality.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(10511) C. C. W. asks how to amalgamate zincs. A. This is accomplished in several ways. 1. By dipping the zinc in dilute sulphuric acid and then dipping the end of it into a small quantity of mercury, after rubbing the surface with a brush. 2. Dissolve 1 pound of mercury in 5 pounds nitro-muriatic acid (nitric acid 1 part, muriatic acid 3 parts), heat the solution gently to hasten the action. When a complete solution of the mercury is effected, add 5 pounds more of nitro-muriatic acid. The solution should be applied with a brush, as immersing the zinc in it is wasteful. 3. To the bichromate solution commonly used

in batteries, add to every pint of solution 1 drachm of bisulphate of mercury or a similar amount of nitrate of mercury (mercury dissolved in nitric acid). By employing this method, the amalgamation of the zincs is maintained continuously after the first amalgamation, which must be accomplished by method 1 or 2. 4. In the Bunsen, Grove, or Fuller battery the amalgamation may be accomplished by placing a small quantity of mercury in the cells containing the zincs. 5. Place a little mercury in a saucer with some dilute sulphuric acid. Dip the zincs into dilute acid. Then with a little strip of zinc or galvanized iron touch the mercury under the acid and rub it on the zinc. This will transfer a little to the surface, and a few minutes' rubbing will make the zincs as bright as silver. A very small globule of mercury is enough for a single plate.

(10512) N. P. E. asks for information concerning vellum. A. A fine kind of parchment prepared from the skins of calves, kids, and lambs. The skins are limed, shaved, washed, and stretched in hoops or other frames, where they are scraped and trimmed with the currier's fleshing knife, and next carefully rubbed down with pumice stone; they are lastly polished with finely powdered chalk or fresh slaked lime, and then dried. A green color is given with a solution of crystallized verdigris to which a little cream of tartar and nitric acid have been added, and a blue color with a solution of indigo. The surface is often finished with white of egg, and subsequent friction. The skins of sheep are commonly used for parchment, those of goats and wolves for drum heads.

(10513) C. L. T. asks for a formula for elastic glue. A. Elastic glue which does not spoil is obtained as follows: Good common glue is dissolved in water, on the water bath, and the water evaporated down to a mass of thick consistence, to which a quantity of glycerine equal in weight with the glue is added, after which the heating is continued until all the water has been driven off, when the mass is poured out into the molds or on a marble slab. This mixture answers for stamps, printer's rolls, galvano-plastic copies, etc.

(10514) S. Y. B. asks for a cement for mica. A. A colorless cement for joining sheets of mica is prepared as follows: Clear gelatine is softened by soaking it in a little cold water, and the excess of water is pressed out by gently squeezing it in a cloth. It is then heated over a water bath until it begins to melt, and just enough hot proof spirit (not in excess) stirred in to make it fluid. To each pint of this solution is gradually added, while stirring, 1-4 ounce of gum ammoniac and 1 1-3 ounce of gum mastic previously dissolved in 4 ounces of rectified spirit. It must be warmed to liquefy it for use and kept in stoppered bottles when not required. This cement, when properly prepared, resists cold water.

(10515) B. N. C. asks how to deodorize alcohol. A. Add to the barrel of alcohol a gallon of water saturated with chlorine gas; agitate thoroughly, let rest for twelve hours, then saturate with chalk (which, combining with the chlorine, forms chloride of lime) and distill. Filtering through animal charcoal after precipitating the chlorine with the chalk affords a very fair substitute for the redistilled alcohol. The fusel oil can be separated from alcohol, in small quantity, by adding a few drops of olive oil and thoroughly agitating in a bottle and allowing it to settle, and then decant. The olive oil combines with and retains the fusel oil.

(10516) B. F. K. asks how to do annealing. A. For a small quantity, heat the steel to a cherry red in a charcoal fire, then bury it in sawdust, in an iron box, covering the sawdust with ashes. Let it stay until cold. For a larger quantity, and when it is required to be very soft, pack the steel with cast iron (lathe or planer) chips in an iron box as follows: Having at least half or three-quarters of an inch in depth of chips in the bottom of the box put in a layer of steel, then more chips to fill spaces between the steel and also the half or three-quarters of an inch space between the sides of the box and steel, then more steel; and lastly, at least one inch in depth of chips, well rammed down on top of the steel. Heat the whole to and keep at a red heat for from two to four hours. Do not disturb the box until cold.

(10517) N. D. R. asks: 1. If the length of the wires from the secondary terminals of an induction coil affect the shock to any extent, the size of wire being No. 18 to No. 20 copper wire. A. The length of wire from the secondary of an induction coil will have little effect upon the shock given, since the resistance of these wires will be very small compared with that of the human body. 2. Why is it that Easter comes on a different day every year? Why not permanent? A. Easter is determined by the full moon nearest to the vernal equinox; hence it cannot be fixed for the same date each year. 3. I have heard that the puffing of a locomotive is due to the exhaust steam from the cylinder. If true, what means are employed to effect the same? A. The steam when it escapes from the cylinders is directed into the smokestack of a locomotive in order to increase the draft. It is the sudden ejection of the steam and its condensation which produces the sound called the puffing of a locomotive.

NEW BOOKS, ETC.

FLÜSSIGE KRISTALLE UND DIE THEORIEN DES LEBENS. By O. Lehmann. Leipzig: Johann Ambrosius Barth. 55 pages; 16mo.; 30 illustrations; flexible cloth. Price, 50 cents.

Although, in leading up to his subject, the author makes a statement that has more foundation in popular belief than in biological experiment, the actual subject is conclusively and learnedly dealt with. The border between animate and inanimate forms of matter presents a wide and almost unexplored field of research, and work in it should be given every encouragement.

THE DESIGN OF STEEL MILL BUILDINGS. By Milo S. Ketchum, C.E. (University of Colorado). Engineering News Publishing Company, 1906. Pp. 480. Price, $4.

Mr. Ketchum's excellent work hardly needs recommendation after the success which attended the first edition. Few books on this subject are provided with illustrations and algebraic tables which so excellently supplement the text. While the book is concerned chiefly with the construction of mill buildings, nevertheless much of the matter will apply equally well to all classes of steel-frame construction.

THE COMPLETE AUTOMOBILE INSTRUCTOR. By Benjamin R. Tillson. New York: John Wiley & Sons, 1907. Pp. 213. Price, $1.50.

Mr. Tillson has succeeded most admirably in condensing the practical knowledge necessary for one to operate and care for an automobile successfully. He has divided his book into questions and their answers. These are subdivided and classified according to their respective uses.

INDUCTION COILS. HOW TO MAKE AND USE THEM. A Practical Handbook on the Construction and Use of Medical and Spark Coils. By Percival Marshall. Thoroughly revised and enlarged by Kurt Stoze. New York: Spon & Chamberlain. 12mo.; paper cover; 70 pages; illustrated. Price, 25 cents.

A most excellent set of directions for making an induction coil and its accessories. The theory of induction is explained in a lucid, simple manner.

MODERN CHEMISTRY. THEORETICAL AND SYSTEMATIC. By William Ramsay, D.Sc. New York: The Macmillan Company. 24mo.; 9 figures; cloth; 2 parts, 329 pages. Price, 70 cents net.

This book is exactly what one needs to "brush up" on when he feels rusty in his chemistry. It contains both theory and description, each complete in itself, conveniently arranged for reference. An excellent book for advanced schools and colleges.

PHOTOGRAPHY FOR STUDENTS OF PHYSICS AND CHEMISTRY. By Louis Derr. New York: The Macmillan Company. 12mo.; cloth; 247 pages, 88 figures. Price, $1.40.

As the title indicates, this little volume goes more into the theoretical aspect of photography than the popular handbooks. It discusses lenses and their defects, diaphragms, color sensitiveness, and methods of color photography, as well as the best ways in which to develop, print, reduce, etc. Although the work is more advanced than the photographer usually considers necessary, it will be found useful by all who wish a good photographic reference book.

ENGLISH WEIGHTS. With their Equivalents in Kilogrammes. By Frederick W. A. Logan. New York: Spon & Chamberlain. Pocket size; 89 pages. Price, 50 cents.

A useful little book for those who are obliged to convert English weights to their metric equivalents. Simply arranged.

PHOTOGRAPHIC CHEMISTRY. By Paul N. Hasluck. Philadelphia: David McKay. 16mo, cloth; 160 pages, illustrated. Price, 50 cents.

Of the greatest possible service to the photographer, amateur or professional, who is not willing to work by mere "rule of thumb." For the beginner, enough elementary chemical theory is given to make the later development of the subject quite plain. Those familiar with chemistry can save time, if they wish, by skipping this portion of the work, and commencing with the photographical theory proper, which is complete in itself.

PRINCIPLES AND PRACTICE OF AGRICULTURAL ANALYSIS. A Manual for the Study of Soils, Fertilizers, and Agricultural Products. Second edition, revised and enlarged. Vol. 1. Soils. By Harvey W. Wiley, A.M., Ph.D. Easton, Pa.: The Chemical Publishing Company. 12mo.; cloth; 618 pages, 92 illustrations. Price, $4.

A book which is indispensable to the agricultural chemist, and of the greatest value to the modern farmer. Written as it is by one of Dr. Wiley's experience and standing, it contains such methods only as have been carefully tested and found reliable. The section on nitrifying organisms fills a want in a department in which far too little practical work has been done on this side of the Atlantic.

AMONG THE WORLD'S PEACEMAKERS. Edited by Hayne Davis. New York: The Progressive Publishing Company, 1907. 16mo.; pp. 400. Price, cloth, $1.65 mailed; paper, $1.10 mailed.

The Arbitration Peace Congress held in New York, April 14 to 17, makes the appearance of a work of this kind valuable at the present time. The book is the epitome of the interparliamentary union, with sketches of eminent members of this international house of representatives and of progressive people who are promoting the plan for permanent peace which this union of lawmakers has espoused. We have made many provisions for mitigating the horrors of war, and are on the way to its ultimate abolition. It is only by the holding of peace congresses and the dissemination of literature like the present work that we can ever expect to mold public opinion to such a point that this relic of barbarism will be obliterated. The present work is an excellent one, filled with most interesting illustrations. The interparliamentary peace movement began October 31, 1887, when delegates from the British Parliament were presented to the President of the United States. The book is filled with very interesting data, and is one which we can commend to our readers.

DIGEST OF UNITED STATES PATENTS OF AIR, CALORIC, GAS, AND OIL ENGINES, AND OTHER INTERNAL COMBUSTION ENGINES, 1789 to 1906. Five volumes. Drawings two volumes, Claims and Briefs two volumes, Indices and List of References one volume. Price, $50 per set of five volumes.

This work is the only one ever published comprising this class of existing patents, and the material has been prepared with great care and labor. The drawings are clear and distinct, and are as readily understandable as those of the patent copies furnished by the Patent Office. It contains all of the reissues, designs, and trade-marks granted during the above period, accompanied by the claims in full, and a brief description of the invention when necessary properly to interpret the claims. The definitions of the sub-classes are also included.

Especial care has been bestowed upon the arrangement of the patents to simplify and facilitate examinations, and to this end the several thousand patents are chronologically arranged under 208 subdivisions. To enhance the value of the Digest as a work of reference, additional sub-classes have been added.

In the general alphabetical indices a complete list of references cited is given by number, name, and date, as well as the interferences, the parties thereto, and the decisions.

The work will be found exceedingly useful by inventors, manufacturers, and attorneys, and particularly by those to whom the Patent Office is not available.

A COMPARATIVE STUDY OF THE MAYAS AND THE LACANDONES. By Alfred M. Tozzer, Ph.D. Report of the Fellow in American Archæology, 1902-1905. New York: Published for the Archæological Institute of America by the Macmillan Company.

In this treatise Mr. Tozzer gives only a suggestion of the great mass of data that he collected during his five years' stay in Yucatan and Southern Mexico. In an ethnological sense the situation that he studied is of the greatest importance. The two branches of the "Maya-Quiche" stock, the "Mayas" specially so called, and the "Lacandones," were originally the same. Since conquest, however, the "Mayas" have been in intimate contact with the Spanish population, while the "Lacandones" have been free from contamination. Apart from the interest attaching to the life and customs of a pure stock, we have the splendid opportunity of comparing the effect of Christianity and its ideals upon a race, one branch of which has been allowed to develop along its own lines.

PRINCIPLES AND PRACTICE OF PLUMBING. By J. J. Cosgrove. Pittsburg: Standard Sanitary Manufacturing Company. Cloth; 12mo.; 267 pp.; 169 illustrations. Price, $3.

Covering as it does almost the entire field of plumbing, technical as well as theoretical, it is a work to be highly recommended as a handbook for all who have to deal with the problems of sanitation as they occur in everyday life. Excellent tables, showing the efficiency of commonly-used materials, the solubility of various salts in water, etc., are included in the volume, giving it great practical value for the architect and builder.

A TEXT BOOK OF ELECTRO-CHEMISTRY. By Max Le Blanc. Translated from the fourth enlarged German edition by Willis R. Whitney and John W. Brown. New York: The Macmillan Company. 12mo.; cloth; 332 pages, 51 illustrations. Price, $2.60 net.

As the title indicates, a translation of the fourth German edition of the treatise by Prof. Le Blanc, with certain additions by the translators. It is composed of several more or less elementary chapters on dissociation and similar subjects, followed by a discussion of conductance, electro-motive force, electrolysis, polarization, etc. The experimental methods used are described as is the apparatus. A uniform system of notation is followed throughout the book. To be recommended as a textbook on the subject.

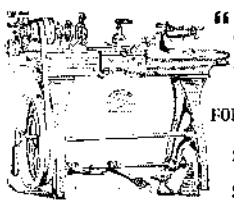
INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending April 16, 1907.

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Adjusting device, F. H. Richards..... 850,252
Agricultural implement, F. W. Miller..... 850,482
Air brake mechanism, J. J. Coit..... 850,564
Air compressor, F. J. Bring..... 850,208
Air or other gases, means for heating compressed, Lloyd & Sodeau..... 850,307
Airship, J. Shukwech 850,800
Annunciator, J. L. McQuarrie..... 850,311
Anvil for riveting machines, C. Johannsen.. 850,651
Assayer's pouring mold, J. J. Bailey..... 850,811
Auger bit, J. T. Parker..... 850,177
Auger, earth, T. F. Litaker..... 850,533
Automobile, water, W. L. Hynes..... 850,370
Automobiles, pedal foot-rest for, S. D. Waldon 850,507
Awl, G. A. Peacock..... 850,779
Axle, vehicle, E. D. Branch..... 850,728
Bag frame fastener, B. vom Eigen..... 850,631
Balls, making playing, F. H. Richards..... 850,253
Bandage, J. Walter 850,281
Bath cabinet, J. Hermann..... 850,367
Battery plate and making same, secondary, L. N. J. Roselle 850,788
Bearing, axle, B. Moore 850,774
Bearing for grinding wheel shafts, D. B. Hyde 850,650
Bed, L. H. Flanders 850,744
Bed, child's, W. H. Muir 850,845
Bed, spring, J. M. Cohron 850,522
Beehive, C. A. Olmstead 850,176
Belt, I. G. Longenecker 850,534
Belt stretcher, O. M. Wolfe..... 850,454
Belt tightener, W. A. Christensen..... 850,135
Bench. See Carpenter's bench.
Bicycle, H. Garza 850,746
Bicycle support, C. P. Ellis 850,527
Bicycles and the like, handle bar for, D. Cronsioe 850,139
Binder, loose leaf, G. Labarre 850,659
Block molding machine, J. C. Herring.... 850,368
Block molds, dividing plate for, F. A. Borst 850,206
Block system, F. B. Corey 850,733
Blowpipe, G. W. Hopkins 850,581
Boat launching and stowing apparatus, F. E. Martin 850,239
Boat, submarine, J. J. Harpain..... 850,831
Boat transporting and launching apparatus, J. J. Harpain 850,643
Boiler, W. J. & G. Lane 850,590
Boiler safety device, automatic, W. S. G. Harris 850,751
Boiler trap, C. Dennis 850,878
Boiler tube cleaner, H. F. Weinland..... 850,701
Boiler tube cleaner, S. F. Dibsdale..... 850,739
Boiler tubes, setting, W. M. Dickerson.... 850,299
Bolt locking device, W. W. Parsons..... 850,540
Book cover protector, Cummings & Jordan 850,735
Boot and shoe tread, pneumatic, I. Tauber 850,327
Bottle, J. H. Dunstan 850,741
Bottle capping machine, O. S. Beyer..... 850,288
Bottle closure, D. O. Lynch 850,437
Bottle closure, F. H. Bills..... 850,613
Bottle, non-refillable, J. C. Uhlein, 850,807, 850,808
Bottle stopper, H. Morgan..... 850,844
Bottle stopper, attachment, H. Bartow.... 850,722
Bottle washing apparatus, R. G. & K. K. Wright 850,199
Bottle wrapper machine, M. Costello..... 850,467
Bottles, support for drying medicine, C. Lohmann 850,381
Bottled goods, delivery case for, N. Breakenridge 850,561
Bowls and the like, holder for, H. Siemund. 850,499
Box fastener, C. H. Veeder 850,195
Brace for roundabouts, J. W. Armitage.... 850,411
Brace for roundabouts and analogous structures, A. Herschell 850,431
Brace for roundabouts and analogous structures, E. O. Spillman 850,449
Brake, V. Lamb 850,436
Brake and other rods, separable jaw for, J. Van Dyke 850,859
Brake beam, J. H. Baker..... 850,335
Brake slack adjuster, automatic, E. M. Swift 850,856
Brick machine, O. Kutsche 850,435
Brick machine, D. P. Sanders..... 850,676
Brick making device, ornamental, A. H. & M. N. Grant 850,427, 850,428
Broiler, J. J. Jones 850,654
Brooder, poultry, E. E. Billings..... 850,725
Broom holder, Hess & Dunn 850,576
Broom machine, C. R. Lee 850,532
Brush holder, Mallett & Brohan..... 850,237
Bucket, dumping, C. Kortvellyessy 850,587
Bucket fastener protector, J. B. Bariani.... 850,556
Buckle, W. A. Schleicher..... 850,794, 850,795
Buckle, I. Blum 850,875
Buckle, wire, W. A. Schleicher... 850,792, 850,793
Buggy tops, means for removably attaching, F. Beasley 850,461
Bundle carrier, H. M. Willis 850,705
Butter cutting machine, P. Brahm 850,464
Button and loop clasp, J. D. Conover..... 850,346
Button, cuff, E. R. Crecelius..... 850,350
Cabinet and receptacle, commodity, J. H. Boye 850,515
Cabinet bracket, clothing, H. Frankel 850,363
Cabinet for music spools, R. J. Cady..... 850,210
Call apparatus, selective, J. A. Hulit.... 850,837
Can. See Refuse can.
Can cutter and spout, E. F. Cavelier..... 850,465
Cane, repeating detonating, Delgrande & Del Grande 850,353, 850,354
Car, convertible dumping, H. L. Aulls 850,719
Car coupling, J. L. Frazier 850,219, 850,301
Car fender, I. R. Guilford 850,474
Car fender, street, M. Greenbaum..... 850,572
Car folding stake, railway, J. W. Kendrick 850,585
Car lift, automatic, G. Holmes..... 850,646
Car loader, box, B. C. Buxton..... 850,132
Car mover, R. F. Hageman 850,154
Car rail and bed, R. Jackson..... 850,759
Car ventilating apparatus, D. Hill..... 850,158
Car window, W. H. Heulings, Jr..... 850,157
Cars, adjustable wall and ventilator for stock, J. Shaw 850,678
Carbureter, W. E. Hallett..... 850,223
Carbureter for gasoline engines, F. E. Bowers 850,339
Card, adjustable tab guide, E. M. Newald 850,245
Card, mechanical, L. H. Glazier 850,150
Carpenter's bench, W. Brucker..... 850,813
Carpet cleaning machine, Heffernan & Hall 850,645
Carpet, moquette or tufted, G. W. Grosvenor 850,573
Carriage numbers, electric tower for displaying, J. H. McDaniel 850,671
Carton, H. Conover 850,345
Cash receiving and change making machine, K. Malmstrom 850,842
Casting apparatus, metal, H. Geisenhoner.. 850,829
Casting machine, H. Jones 850,653
Cement kiln, W. H. Harding..... 850,750
Cement, making hydraulic, E. Mueller..... 850,778
Centrifugal machine, H. G. Morris 850,241
Centrifugal machine, E. A. Forsberg 850,472
Centrifugal machines, shaft mounting for, M. L. Hoyt 850,477
Chafing dish, Savage & Chapman 850,401
Chain, conveyer, M. Garland 850,149
Chair roller appliance, rocking, E. W. Raymond 850,782
Check or other financial instrument blank, J. S. Metcalfe 850,388
Chimney top, P. H. Bayley 850,126
Chimney top, S. M. Kemp 850,372
Chin rest and shoulder pad support, J. J. Morrissey 850,775, 850,776
Churn, N. P. Dazey 850,525
Cigarette box, S. S. Peer 850,182
Cigarettes, machine for making conical, R. Ermeler 850,742



"Star" Foot and Power Screw Cutting Automatic Cross Feed **Lathes**

FOR FINE, ACCURATE WORK

Send for Catalogue B.

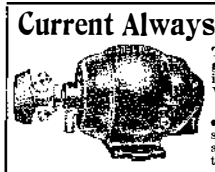
SENECA FALLS MFG. CO.
695 Water Street,
Seneca Falls, N.Y., U.S.A.

Engine and Foot Lathes

MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE

SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.

Current Always at Your Command



The engine on your motor car or boat gives the most power only when your ignition current gives big, hot sparks. With an

Apple Battery Charger

on your car, you have a steady, sure source of current on which you can always rely. Write for full information to-day.

The Dayton Electrical Mfg. Co., 98 St. Clair St., Dayton, Ohio

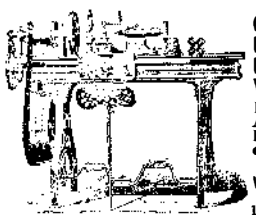
PATENTS

Our Hand Book on Patents, Trade-Marks, etc., sent free. Patents procured through Munn & Co. receive free notice in the

SCIENTIFIC AMERICAN

MUNN & CO., 361 Broadway, N.Y.

BRANCH OFFICE: 625 F St., Washington, D.C.



FOR **GUNSMITHS, TOOL MAKERS, EXPERIMENTAL & REPAIR WORK, ETC.**

From 9-in. to 13-in. swing. Arranged for Steam or Foot Power, Velocipede or Stand-up Treadle.

Send for Lathe Catalog.

W. F. & JNO. BARNES CO.
Established 1872.
1999 Ruby St., ROCKFORD, ILL.

How to Construct An Independent Interrupter

In SCIENTIFIC AMERICAN SUPPLEMENT, **1615**, A. Frederick Collins describes fully and clearly with the help of good drawings how an independent multiple interrupter may be constructed for a large induction coil.

This article should be read in connection with Mr. Collins' article in SCIENTIFIC AMERICAN SUPPLEMENT, **1605**, **"How to Construct a 100-Mile Wireless Telegraph Outfit."**

Each Supplement costs 10 cents; 20 cents for the two. Order from your newsdealer or from

MUNN & CO., 361 Broadway, New York

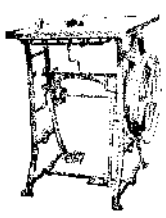
The Best Dry Battery for AUTOMOBILE SPARKING

IS THE

Becko Spark Cell

4 Cells $1.25

J. H. BUNNELL & CO.
Electrical Manufacturers 20 Park Place, NEW YORK



The Kickdrive Circular Saw

Is a simple power for light work of the kinds most done by carpenters, cabinet, box pattern and picture frame makers, and wood workers generally, besides engravers and electrotypers. This Machine has a strong, solid iron frame and steel shaft; is thoroughly well-built and suitable for various kinds of work, as ripping, cross-cutting, grooving, etc. Can be operated sitting or standing. We also make all kinds of foot power devices.

MAYER SLOTKIN
210-212 Canal St., New York.

Instructive Scientific Papers

ON TIMELY TOPICS

Price 10 Cents each by mail

ARTIFICIAL STONE. By L. P. Ford. A paper of immense practical value to the architect and builder. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

THE SHRINKAGE AND WARPING OF TIMBER. By Harold Busbridge. An excellent presentation of modern views; fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

CONSTRUCTION OF AN INDICATING OR RECORDING TIN PLATE ANEROID BAROMETER. By N. Monroe Hopkins. Fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

DIRECT-VISION SPECTROSCOPES. By T. H. Blakesley, M.A. An admirably written, instructive and copiously illustrated article. SCIENTIFIC AMERICAN SUPPLEMENT No. **1493.**

HOME MADE DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS **161** and **600** contain excellent articles with full drawings.

PLATING DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS **720** and **793** describe their construction so clearly that any amateur can make them.

DYNAMO AND MOTOR COMBINED. Fully described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENTS **844** and **865.** The machines can be run either as dynamos or motors.

ELECTRICAL MOTORS. Their Construction at Home. SCIENTIFIC AMERICAN SUPPLEMENTS **759, 761, 767, 641.**

Price 10 Cents each, by mail

Order through your newsdealer or from

MUNN & COMPANY
361 Broadway New York

Circuit detecting device, I. M. Schmidt	850,258
Circular distributer, R. G. Fraser	850,826
Cistern former, C. A. Mitchell	850,667
Clasp, O. Fisher	850,743
Clasp, C. C. Wright	850,864
Cleaning compound, Barrickman & Byers	850,557
Clip, R. W. Roberts	850,185
Clipping machines, device for adjusting the height of the cut in hair, R. Klein	850,656
Clocks and watches to changes in temperature, adjusting, S. Kahan	850,887
Clod fender, M. L. Harris	850,574
Closet seat, Till & Newton	850,505
Clothes line hanger, B. J. Lee	850,235
Clothes line, pinless, Hook & Robinson	850,227
Clothes wringer clamp, G. H. Jantz	850,584
Clutch, W. H. Klocke	850,164
Clutch, C. M. Spencer	850,854
Clutches, means for operating log haul, F. P. Quinn	850,250
Coal washing apparatus, Martin & Cory	850,594
Coating on a non-vitreous surface, producing a metallic, Heller & Baumgartl	850,753
Cock, compression, D. Smith	850,679
Cock, stop and waste, W. H. Rawe	850,251
Coffee percolater, L. Wojidkow	850,709
Coin collector circuit, H. M. Crane	850,349
Coin collector circuit, H. D. Currier	850,352
Coin controlled machine, A. A. Caille, et al	850,817
Combination device, J. Reyse	850,255
Concrete mixer, W. C. Dayhoff	850,469
Concrete walls, making, F. M. Jackson	850,758
Condenser, acid, J. Broome	850,517
Condenser and making the same, electrical, R. C. Lanphier	850,166
Conduit traveler, L. D. Shaffer	850,797
Conduits, adjusting means for interlocking, J. L. Fay	850,825
Conveyer, endless, F. A. M. Smulders	850,684
Cooker, steam, Eppley & Stoneslfer	850,824
Cooking utensil, J. R. Donnelly	850,143
Cork holder and bottle stopper, combined, J. M. Selden	850,403
Cork puller, C. S. Rees	850,184
Cork wafer cutting apparatus, H. F. Busch	850,519
Corn gathering machine, McClure & Loewenstein	850,390
Corn shock leader, D. T. Phillips	850,543
Cotton chopper, F. M. Hutchinson	850,531
Cotton, means for controlling feed of, T. A. Andrews	850,716
Crane, overhead traveling, W. H. Morgan	850,439
Crane, traveling, Strobel & Hegrebe	850,437
Crate, N. J. McLeod	850,537
Cream separator, S. W. Stewart	850,805
Cream separators, setting gage for, F. A. Gehrman	850,588
Cross tie, J. W. Peploe	850,512
Crushing mill, J. Morin	850,506
Culinary utensil, M. C. Horton	850,582
Cutivator, W. E. Butterfield	850,520
Cultivator, L. E. Waterman	850,861
Cuprammonium solutions, manufacturing, J. M. A. Vermeesch	850,695
Curbing, C. E. De Clements	850,866
Current wheel, M. J. Miller	850,438
Currycomb, W. D. Wheat	850,282
Curtain holder, vestibule, W. E. Tippett	850,193
Curtain holding device, G. H. Davis	850,297
Curtain or shade fixture, window, S. R. Skov	850,186
Curtain roller, H. Gross	850,153
Curved pipe, W. C. Kirk	850,586
Cut off, water spout, J. P. Kolla	850,702
Cut off or fuse box, automatic, Anderson & Frenberg	850,334
Cycle sled, J. Baldauf	850,125
Damper regulator, C. S. Hood	850,530
Dental engine, J. A. Lewis	850,661
Differential clip for aerial ropeways, etc., Y. Tamamura	850,504
Disinfecting tablet, W. H. Power	850,849
Display apparatus, W. A. McKeny	850,243
Display device, S. W. Huntington	850,649
Display fixture base, H. Frankel	850,882
Display rack, A. B. Hall	850,221
Display rack attachment, E. B. Weston	850,554
Distribution system, B. Frankenfield, 850,217,	850,218
Distribution system, L. L. Tatum	850,278
Document holder, M. I. Sullivan	850,408
Door bolt, E. Schlegtendal	850,322
Door check and closer, P. Papenfoth	850,394
Door closer and check, G. Rischmuller	850,545
Double ended wrench, G. W. Rowell	850,493
Dough dividing machine, R. J. F. & A. E. Aldred	850,332
Dough raiser, M. Burgess	850,815
Dovetail tenon and mortise, W. D. Kelly	850,889
Dovetailing and tenoning machine, W. D. Kelly	850,888
Draft equalizer, W. Matteson	850,535
Draft gear rigging, Scott & Thelin	850,498
Draft hook, safety, C. W. Fanton	850,359
Drawbridge rail lock, J. M. Hysan	850,161
Drawing board, E. Werner	850,552
Drier, A. Ramos	850,398
Drilling machine atachment, A. G. Baumeister	850,204
Drum, Leedy & Wanamaker	850,306
Dumb waiter shaft, G. Rader	850,602
Dumping apparatus, S. W. Hopkins	850,648
Dust cleaner, G. Hegyi	850,575
Duster, W. Laycock	850,761
Dusters and brushes, machine for making feather, J. E. Snevely	850,685
Edge folding and seam closing machine, duplex, J. Bingham	850,614
Egg preservative and making same, E. Utescher	850,693
Electric apparatus, cut out for vapor, T. Van Aller	850,279
Electric apparatus, vapor, C. P. Steinmetz	850,270
Electric conductors in conduits or pipes, apparatus for threading or laying, T. J. Cope	850,625
Electric machine, dynamo, K. Sulzberger	850,276
Electric machine, dynamo, C. Macmillan	850,664
Electric motor, R. E. Barker	850,203
Electric motor and controller for the same, J. H. Hertner	850,475
Electric motor starting device, Knapp & Cade	850,165
Electric signal, Lienais & Sutton	850,766
Electric switch, C. J. Toerring	850,506
Electric transportation system, W. C. McMurray	850,173
Electrical indicator, Summers & Berry	850,691
Electrical switch, R. H. Manson	850,870
Electrolytic apparatus, A. G. Betts	850,127
Electrolytic cell battery, R. H. F. Finlay	850,867
Electroplating cells, anode for, G. M. Elliott	850,823
Elevator. See Grain elevator.	
Elevator boot, F. C. Payne	850,541
Elevator signaling apparatus, J. D. Bowne	850,618
Elevator valve mechanism, R. C. Bromley	850,619
Emergency brake, J. A. Birdsall	850,414
Engine attachment, traction, J. E. Holland	850,835
Engine gear, traction, A. Harrold	850,644
Engine steering gear, traction, R. Richardson	850,850
Engraving machine attachement, C. A. C. Wagenfohr	850,550
Envelop machine, C. E. Dulin	850,879, 850,880
Equalizing and distributing fitting, G. W. Clark	850,622
Excavator beam, L. A. Desy	850,356
Explosive, F. Sparre	850,268, 850,502
Explosive, ammonium nitrate, F. Sparre	850,325
Explosive and making same, F. Sparre	850,326
Explosive and making same, ammonium nitrate metallic, F. Sparre	850,267
Explosives, waterproof composition for, F. Sparre	850,266
Eyeglasses, A. A. Day	850,213
Fabric tester, R. C. Harris	850,832
Fan, I. Wakefield	850,609
Fan, ventilating, L. L. Holladay	850,226
Farrier's knife, D. R. Baldwin	850,720
Fastening device, J. J. O'Connell	850,599
Feed, automatic boiler, M. L. Phipps	850,314
Feed water heater, Wright & Casey	850,707
Fence machine, E. W. Channell	850,343
Fence machine, wire, C. A. & I. D. Blume	850,617
Fence post, E. D. Miner	850,773
Fence tightener, wire, L. H. Beltzer	850,612
Fencing, wire, G. S. MacLeod	850,308
Fiber digester, wood, G. H. Mallam	850,384
Fire alarm apparatus, G. W. Smith	850,853
Fire and burglar alarm, combined, A. M. Bennett	850,287

HAYNES THE STORY OF THE HAYNES

The first Haynes car was the first American gasolene vehicle (1893), and it now in the Smithsonian Institute Museum to illustrate the history of the automobile. Its successors were built in the first automobile factory to be built in America. It has taken time to develop the automobile, and Haynes had a long start.

The original leadership has never been lost.

Low tension make-and-break ignition originated in the Haynes models of 1895. The Haynes began the march of improvements in materials by introducing nickel steel. Aluminum alloy for bodies and for engine parts was used first in the Haynes. The Haynes were the first cars to be equipped with large wheels. The side entrance body was a Haynes introduction. In a multitude of details the Haynes has been universally imitated. There is no doubt but that the Haynes has been more copied *from* than any other car.

To-day in their simplicity, reliability and perfection, the Haynes models are still ahead of their rivals, embodying devices that will be imitated in other cars in later years.

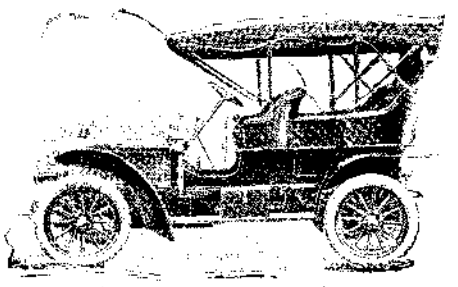
The Vanderbilt Elimination Race proved the quality of a Haynes when a regular stock model—the only stock model entered—won its place on the American Team against the best special designs America could produce. In the final Cup Race, against special racing cars of twice its horse-power, its wonderful showing is too well known to need repeating.

Address Desk H 5

HAYNES AUTOMOBILE CO., Kokomo, Ind.

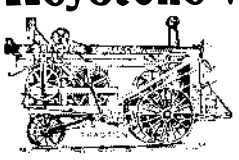
Oldest Automobile Manufacturers in America. Members A.L.A.M.

NEW YORK, 1715 Broadway; CHICAGO, 1420 Michigan Ave.



1907. Model S. 30 H. P. $2,500

Keystone Well Drills



for Artesian and Ordinary Water Wells; Mineral Prospecting and Placer Testing for Dredgers; Deep Drilling for Oil and Gas; Contractor's Blast Hole Drilling, River and Harbor Exploration, etc. Our five catalogs are text-books in these lines.

KEYSTONE WELL WORKS
Beaver Falls, Pa.

Kerosene Oil Engines

Marine, Stationary, Portable

NO DANGER, Maximum Power, Lightest Weight, Simple, Reliable, Economical. No Batteries, Self Ignition by Compression. Fully guaranteed. Write for Catalogue S. A. ☞ No charge for packing.

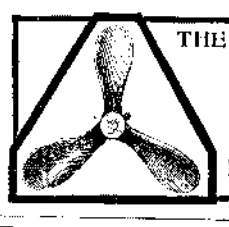
INTERNATIONAL OIL ENGINE CO.
38 Murray St., New York, U. S. A.

Asbestos and Magnesia Products

STEAM PIPE AND BOILER COVERINGS.
ASBESTOS PACKING (For all purposes).
ASBESTOS FIRE-RESISTING CEMENTS.
ASBESTOS BUILDING MATERIALS.
"J-M" ASBESTOS ROOFING.
ASBESTOS FABRICS.
KEYSTONE HAIR INSULATOR.
ELECTRICAL SUPPLIES.

H. W. JOHNS-MANVILLE CO.

New York, Milwaukee, Chicago, Boston, Philadelphia, St. Louis, Pittsburg, Cleveland, New Orleans, Kansas City, Minneapolis, San Francisco, Los Angeles, Seattle, London.



THE NORWALK BRASS CO.

For All Purposes

NORWALK, CONN.

FUEL GAS

GENERATOR — FROM NAPHTHA FOR — FREE CATALOG.

GANNERS, LAUNDRIES, SHOPS, LABORATORIES & ALL MANUFACTURING.

SPRINGFIELD FUEL GAS MACHINES.

GILBERT & BARKER MANFG CO. 82-4th AV. N.Y. CITY

ALCOHOL

Its Manufacture
Its Denaturization
Its Industrial Use

The Cost of Manufacturing Denaturized Alcohol in Germany and German Methods of Denaturization are discussed by Consul-General Frank H. Mason in SCIENTIFIC AMERICAN SUPPLEMENT 1550.

The Use, Cost and Efficiency of Alcohol as a Fuel for Gas Engines are ably explained by H. Diederichs in SCIENTIFIC AMERICAN SUPPLEMENT 1596. Many clear diagrams accompany the text. The article considers the fuel value and physical properties of alcohol, and gives details of the alcohol engine wherever they may be different from those of a gasoline or crude oil motor.

In SCIENTIFIC AMERICAN SUPPLEMENT 1581 the **Production of Industrial Alcohol and its Use in Explosive Motors** are treated at length, valuable statistics being given of the cost of manufacturing alcohol from farm products and using it in engines.

French Methods of Denaturization constitute the subject of a good article published in SCIENTIFIC AMERICAN SUPPLEMENT 1599.

How Industrial Alcohol is Made and Used is told very fully and clearly in No. 3, Vol. 95, of the SCIENTIFC AMERICAN.

The Most Complete Treatise on the **Modern Manufacture of Alcohol,** explaining thoroughly the chemical principles which underlie the process without too many wearisome technical phrases, and describing and illustrating all the apparatus required in an alcohol plant is published in SCIENTIFIC AMERICAN SUPPLEMENTS 1603, 1604 and 1605. The article is by L. Baudry de Saunier, the well-known French authority.

In SUPPLEMENTS 1607, 1608, 1609 we publish **a digest of the rules and regulations** under which the U. S. Internal Revenue will permit the manufacture and denaturation of tax free alcohol.

A Comparison of the **Use of Alcohol and Gasoline in Farm Engines** is given in SCIENTIFIC AMERICAN SUPPLEMENTS 1634 and 1635 by Prof. Charles E. Lucke and S. M. Woodward.

The Manufacture, Denaturing and the Technical and Chemical Utilization of Alcohol is ably discussed in the SCIENTIFIC AMERICAN SUPPLEMENTS 1636 and 1637 by M. Klar and F. H. Meyer, both experts in the chemistry and distillation of alcohol. Illustrations of stills and plants accompany the text.

The Sources of Industrial Alcohol, that is the Farm Products from which alcohol is distilled, are enumerated by Dr. H. W. Wiley in SCIENTIFIC AMERICAN SUPPLEMENTS 1611 and 1612 and their relative alcohol content compared.

The Distillation and Rectification of Alcohol is the title of a splendid article by the late Max Maercker (the greatest authority on alcohol), published in SCIENTIFIC AMERICAN SUPPLEMENTS 1627 ond 1628. Diagrams of the various types of stills in common use are used as illustrations.

In SCIENTIFIC AMERICAN SUPPLEMENT 1613 the **uses of Industrial Alcohol in the Arts and in the Home are discussed.**

Any Single Number of the SCIENTIFIC AMERICAN or SUPPLEMENT will be sent for 10 cents by mail. The entire set of papers above listed will be mailed on receipt of $2.00.

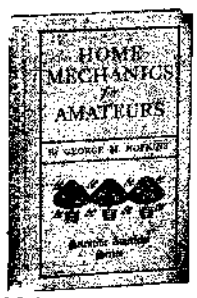
Order from your newsdealer or from the publishers

MUNN & COMPANY, 361 Broadway, New York

Valuable Books

Home Mechanics for Amateurs

This book has achieved an unparalleled success in one week, and a Special Edition of 4,000 copies has been ordered. It is by far the largest and best book on the subject ever offered at such a low price. It tells how to make things the right way—the "only" way—at small expense. It will prove of value to you—much more than you realize. Do things with your hands. Send for a circular giving contents—the circulars cost only a cent—the book $1.50 postpaid. If the book could meet you face to face you would be the first to purchase. The first large edition is almost gone, order to-day.



370 Pages 326 Engravings Price $1.50

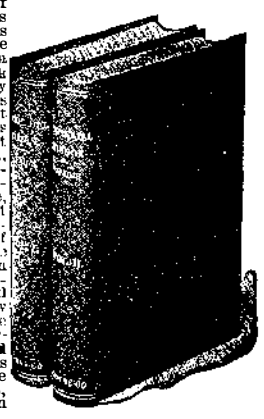
TWENTY-THIRD EDITION

EXPERIMENTAL SCIENCE.

By GEORGE M. HOPKINS

Revised and Greatly Enlarged. 2 Octavo Volumes. 1,100 Pages. 900 Illustrations. Cloth Bound, Postpaid, $5.00. Half Morocco, Postpaid, $7.00.

EXPERIMENTAL SCIENCE is so well known to many of our readers that it is hardly necessary now to give a description of this work. Mr. Hopkins decided some months ago that it would be necessary to prepare a new edition of this work in order that the many wonderful discoveries of modern times might be fully described in its pages. Since the last edition was published, wonderful developments in wireless telegraphy, for example, have been made. It was necessary, therefore, that a good deal of new matter should be added to the work in order to make it thoroughly up-to-date, and with this object in view some 300 pages have been added. On account of the increased size of the work, it has been necessary to divide it into two volumes, handsomely bound in buckram.



REVISED and ENLARGED EDITION

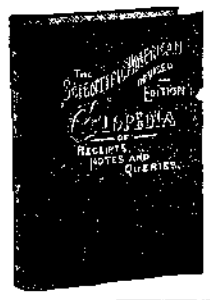
The Scientific American

Cyclopedia

Of Receipts, Notes and Queries.

15,000 Receipts. 734 Pages.

Price, $5.00 in Cloth. $6.00 in Sheep. $6.50 in Half Morocco. Post Free.



This work has been revised and enlarged,

900 New Formulas.

The work is so arranged as to be of use not only to the specialist, but to the general reader. It should have a place in every home and workshop. A circular containing full **Table of Contents** will be sent on application.

Those who already have the Cyclopedia may obtain the

1901 APPENDIX.

Price, bound in cloth, $1.00 postpaid.

MAGIC

Stage Illusions and Scientific Diversions, including Trick Photography.

This work appeals to old and young alike, and it is one of the most attractive holiday books of the year. The illusions are illustrated by the highest class of engravings, and the exposés of the tricks are, in many cases, furnished by the prestidigitateurs themselves. Conjuring, large stage illusions, fire-eating, sword-swallowing, ventriloquism, mental magic, ancient magic, automata, curious toys, stage effects, photographic tricks, and the projection of moving photographs are all well described and illustrated, making a handsome volume. It is tastefully printed and bound. Acknowledged by the profession to be the **Standard Work on Magic.**

By A. A. HOPKINS. 568 pages. 420 illus. Price $2.50.

JUST PUBLISHED

Scientific American Reference Book

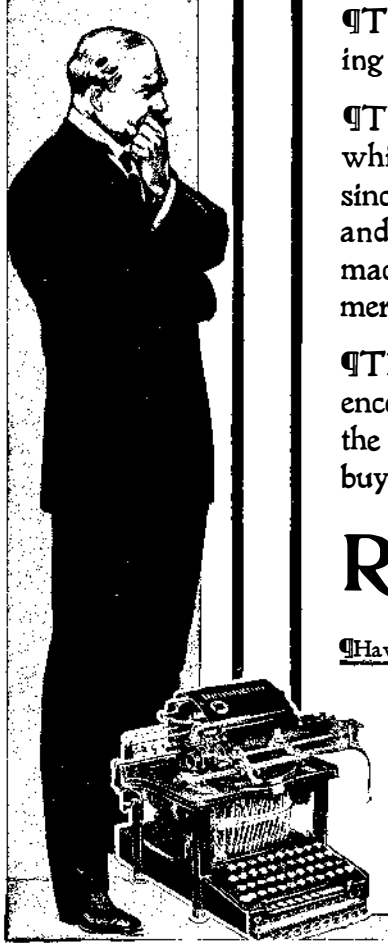
12mo. 516 Pages. Illustrated. 6 Colored Plates. Price $1.50, postpaid

The result of the queries of three generations of readers and correspondents is crystallized in this book, which has been in course of preparation for months. It is indispensable to every family and business man. It deals with matters of interest to everybody. The book contains 50,000 facts and is much more complete and more exhaustive than anything of the kind which has ever been attempted. The "Scientific American Reference Book" has been compiled after gauging the known wants of thousands. It has been revised by eminent statisticians. Information has been drawn from over one ton of Government reports alone. It is a book of everyday reference—more useful than an encyclopedia, because you will find what you want in an instant in a more condensed form. Sixty years of experience alone have made it possible for the publishers of the SCIENTIFIC AMERICAN to present to the purchasers of this book a remarkable aggregation of information.

MUNN & CO., Publishers, 361 Broadway, NEW YORK

Fire and temperature alarm or indicator, G. L. Smith	850,681
Fire resisting shutter, E. H. McCloud	850,172
Fish, preserving, J. Thomlinson	850,451
Fish tank on transporting car or the like, G. Reinhardt	850,316
Fishing reel, E. Holzmann	850,580
Floor, dumping, J. F. Dornfeld	850,214
Floor surfacing machine, Kiebler & Stahl	850,229
Flower pot machine, C. Schwarzkopf	850,323
Fluid pressure and motor controller, automatic, W. J. Bell	850,412
Flying machine, A. P. Bliven	850,616
Fodder cutter, G. A. Booze	850.727
Foot rest, W. D. Bagley	850,458
Fragile vessels, protective device for, S. Ferguson	850,633
Freezer, J. H. McKinney	850,442
Friction coupling, H. H. Benn	850,462
Fruit gatherer, E. H. Denton	850,355
Fuel block and producing same, artificial, M. M. Kline	850,232
Fuel blocks, machine for forming artificial, M. M. Kline	850,163
Furnace front, water cooled, A. L. Hammerberg	850,155
Furnaces, compound for facing the ports of open-hearth steel, Beale & McDowell	850,723
Furniture construction, G. W. Myers	850,669
Fuse, alarm, W. E. Harkness	850,365
Fuse in circuit, cut out block for connecting, Hornsby & Anger	850,836
Game apparatus, H. L. Haskell	850,224
Game apparatus, J. H. Price	850,489
Game board, A. Collier	850,137
Garment pads, making, G. Goldman	850,151
Garment supporter, M. Frerkson	850,638
Gas burner regulating valve, F. Egge	850,569
Gas engine, W. H. Ash	850,718
Gas generator, acetylene, H. S. Gallup	850,148
Gas producers, feed mechanism for, A. L. Parker	850,395
Gas, purifying, G. G. Smith	850.680
Gate, W. M. Watson	850,699
Gate opener, automatic, T. J. McGinnis	850,441
Gear, change speed, H. T. Thomas	850,857
Gear, reverseible transmission, O. Petri	850,247
Gear transmission mechanism, C. H. Schabinger	850,257
Gearing, J. F. McCanna	850,597
Generator. See Gas generator.	
Glass furnace, C. J. Koenig	850,233
Glass mold, S. Hipkins	850,577
Glass ornamentation for panels, floors, etc., O. O. Newman	850,538
Glass structures, corner clamp for plate, D. A. Cowan	850,348
Glass, treating, W. E. Heal	850,833
Governing device for marine engines, W. J. H. Fresen	850,473
Governor, electric and pneumatic, H. W. Young	850,329
Grain elevator, T. F. Hall	850,222
Grain lifter, L. Wikoff	850,704
Grains and similar goods, pneumatic device for drawing out, P. & C. Gebhardt	850,639
Gramophone record tablet, J. Sanders	850,494
Grass catching receptacle, L. Brown	850,418
Grinding machine, C. King	850,374
Gyratory crusher, O. C. Redding	850,491
Hair curling device, H. I. West	850,553
Hair waver, S. H. Tolman	850,452
Hammer, power, J. H. Conlen	850,212
Harrow, W. C. Cook	850,296
Harvester, pneumatic cotton, J. E. Worswick	850,700
Hay loader, H. V. Congrove	850,138
Hay rack, C. W. Baird	850,285
Headlight, locomotive, R. M. Spillman	850,802
Headlight, vehicle, F. G. Frankenberg	850,570
Heater, Cape & Durley	850,818
Hinge for doors and like movable objects, O. M. Edwards	850,422
Hoe, D. B. Curry, Jr.	850,736
Hoist, W. E. Hutchings	850,757
Hoisting apparatus, automatic stop for electric, H. S. Valentine	850,694
Hoisting machine brake, G. C. Grable	850,152
Hoops to casks and barrels, machine for applying bilge, E. C. Thorschmidt	850,692
Horn, folding, O. Kraus	850,375
Horse knee boot, pneumatic, R. C. Bever	850,128
Horseshoe calk, J. T. Bell	850.286
Hose supporter, E. Middleton	850,240
Hot water heater, T. H. Campbell	850,620
Hub, wheel, F. F. Unckrich	850,328
Hydrocarbon burner, McCarren & Duffy	850,440
Ice box, G. E. Lovell	850,663
Ice, making sanitary carbonated, A. Schroder	850,607
Ice saw, T. M. Butler	850,292
Incubator, J. L. Cousins	850,523
Index tab cards, label holder for, Seyl & Butts	850,324
Indigo, making, Rahtpen & Stephan	850,444
Ink well, J. W. Jacobus	850,478, 850,479
Inkstand construction, E. Davis	850,468
Invalid lifting apparatus, W. B. Closson	850,624
Iron holder, M. Agneessens	850,713
Ironing machine, S. J. Tobiasz	850,608
Journal bearing, G. T. Reiss	850,399
Kettle cover, A. Seys	850,677
Keyhole guard for locks, A. Robbins	850,446
Knapsack, L. M. Norwood	850,312
Knife handle, Cooper & Oliver	850,420
Knitting machine, Rieffel & Ittershagen	850,786
Knitting machine fabric take up mechanism, B. T. Steber	850,855
Knitting machines, splicing yarn feed device for, H. A. Houseman	450,476
Ladder, step, A. W. Derby	850,142
Lamp, inverted burner gas, W. De Freitas	850,568
Lamp lighting device, gas, H. K. Wilson	850,509
Lamp shade holder, Holt & Foster	850,579
Lantern, F. K. Wright	850,455
Laundry bag, W. E. Voss	850.697
Lawn cleaner, C. H. Mosher	850,777
Leather drying rack, R. Buchhold	850,131
Leather skiving machine, D. Daniels	850,627
Leather trimmer, A. Larson	850,591
Lifting jack, J. H. Burkholder	850,209
Lifting mechanism, automatic, G. Holmes	850,647
Light regulator, window, H. Alrich	850,201
Lighter or barge, F. A. M. Smulders	850,683
Line carrier, L. D. Shaffer	850.798
Liquid applying device, G. A. Burdett	850,814
Liquid receptacle, H. W. Eden	850,822
Liquid treating apparatus, H. H. Sutro	850,503
Liquids of different specific gravities, apparatus for separating, J. H. Cayford	850,419
Lock, F. S. Aliano	850,333
Lock, J. C. Dawson	850,877
Lock and latch, B. Phelps	850,179
Loom, G. C. Moore	850,595
Loom, haircloth, G. Taylor	850,806
Loom picker stick attachment, D. Lemoine	850.841
Loom weft replenishing mechanism, J. Bim	850,336
Lubricator sight, W. L. Abate	850,711
Lumber together, apparatus for securing the component parts of compound, P. F. Bolton	850,338
Mail bag delivery apparatus, D. F. Lahman	850,588
Mail bag delivery apparatus, P. H. Sudbrock	850,690
Mantle firing flames, regulator for, H. Heidorn	850,752
Massage instrument for applying ointments, lotions, etc., W. Doyle	850,357
Match boxes, etc., holder or receptacle for, E. Demellus	850,141
Measuring instrument, portable electric, H. Bourgeois	850,129
Measuring machine, W. T. Hollis	850,304
Metal, composite, T. A. Edison	850,881
Metal core in a plastic body, machine for enveloping a, W. Poppendieck	850,780
Metal sheets, coating, L. C. Steele	850,548
Metal sheets or plates, machine for cutting or shearing, J. Abbott	850,611
Metal transfer device, R. H. Stevens	850,190
Metals by electrolysis, producing light, von Kugelgen & Seward	850,376
Metallic tie, J. D. Bowne	850,876
Metallic tie and rail fastener, J. B. Novack	850,598
Meter. See Proportional meter.	
Meter, W. Stanley	850,687
Mining machine, E. G. Tillman	850,192
Minnow trap, A. J. Algate	850,123
Miter box, J. L. Pringle	850,873
Mold, F. T. Dickinson	850,629

THINK!



¶Think of the number of typewriters that seemed popular a few years ago.

¶Think of the different ones seeking public favor today.

¶Then think of the Remington, which has been the standard since typewriters were invented and which maintains its supremacy solely through lasting merit.

¶The man who *seeks* experience may seek it anywhere, but the man who *heeds* experience buys the

Remington

¶Have you tried the new Remington escapement? It will be a revelation to you of the latest and best in typewriter achievement.

Remington Typewriter Co.

New York and Everywhere

The Scientific American Boy

By

A. RUSSELL BOND

12mo. 320 Pages. 340 Illustrations.

Price $2.00 Postpaid

THIS is a story of outdoor boy life, suggesting a large number of diversions which aside from affording entertainment will stimulate in boys the creative spirit. In each instance complete practical instructions are given for building the various articles.

¶ The needs of the boy camper are supplied by the directions for making tramping outfits, sleeping bags and tents; also such other shelters as tree houses, straw huts, log cabins and caves.

¶ The winter diversions include instructions for making six kinds of skate sails and eight kinds of snow shoes and skis, besides ice boats, scooters, sledges, toboggans and a peculiar Swedish contrivance called a "rennwolf."

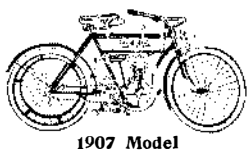
¶ Among the more instructive subjects covered are surveying, wigwagging, heliographing and bridge building, in which six different kinds of bridges, including a simple cantilever bridge, are described.

¶ In addition to these, the book contains a large number of miscellaneous devices, such as scows, canoes, land yachts, windmills, water wheels and the like. A complete table of contents sent on request.

MUNN & COMPANY

361 Broadway PUBLISHERS OF "SCIENTIFIC AMERICAN" New York City

GENTLEMEN
WHO DRESS FOR STYLE NEATNESS, AND COMFORT WEAR THE IMPROVED
BOSTON GARTER
THE RECOGNIZED STANDARD
The Name is stamped on every loop—
The Velvet Grip CUSHION BUTTON CLASP
LIES FLAT TO THE LEG—NEVER SLIPS, TEARS NOR UNFASTENS
Sample pair, Silk 50c., Cotton 25c. Mailed on receipt of price.
GEO. FROST CO., Makers
Boston, Mass., U. S. A.
ALWAYS EASY



1907 Model
Merkel Motor Cycle
The only comfortable, non-injurious motor cycle on the market, built on the latest model, including the famous "Merkel" motor, Grip control, and **Spring Frame** and **Fork**, absolutely the safest and speediest roadster or racer yet made.
Write for Catalogue and Prices
MERKEL MOTOR CO.
1092, 26th Avenue, Milwaukee, Wis.

Convert Your Bicycle Into a Motorcycle

at small cost by attaching the **self-starting Erie 2 H.P. Power Outfit.** This includes all parts. Anyone can easily make a **powerful motorcycle,** Speed 2-30 miles an hour. **2-3 H.P. Motorcycles.** Send stamp for either catalog.
MOTORCYCLISTS Send 15 one-cent stamps for new book, **"The Motorcycle."** It tells about the mechanism, care, operation, how to get more power, etc.
MOTORCYCLE EQUIPMENT CO., 5 Lake, Hammondsport, N. Y.

Whipple The Motor-Cycle Man
(Pioneer Motor-Cyclist of Chicago)
Can and will save you money on new or second-hand motor-cycle. General agent and distributor seven leading makes—also **Ferro Motor Boat Engines**—with satisfied patrons the world over. If you have the "motor-cycle fever" let me prescribe for you.
WHIPPLE "The Motor-Cycle Man"
262 West Jackson Boulevard, CHICAGO

Marine Engines For power boats, pleasure launches, and towing craft. Perfect in every mechanical detail. Designed and built by eldest marine engine builders in the West. Greater speed, more power, less vibration per H. P. than any marine engine built. Two speeds. 1 to 500 H.P. 4 cycle. Single, double, 4, 8 and 12 cylinders. Don't place your order until you get our latest pamphlet and prices on engines and marine fittings.

2616 DeKalb St. St. Louis, U. S. A.
ST. LOUIS GAS & GASOLINE ENGINE COMPANY

Important to Subscribers for Scientific American in Canada

Owing to recent changes in the Postal Laws, copies of SCIENTIFIC AMERICAN mailed to addresses in Canada will have to be prepaid by stamps affixed at the rate of one cent for each four ounces or fraction thereof.

Commencing May 1, 1907, the rates for subscriptions for our periodicals mailed to Canada, *postage prepaid*, will be as follows:

	PER YEAR
Scientific American	$3.75
Supplement	5.50
American Homes and Gardens	3.50
Scientific American and Supplement (to one address)	8.25
Scientific American and American Homes and Gardens (to one address)	6.25

MUNN & COMPANY, Publishers
SCIENTIFIC AMERICAN OFFICE
361 BROADWAY, NEW YORK

Mold forming machine, J. Macphail, 850,768 to	850,770
Molding process, A. R. Marsteller	850,168
Molding process, T. W. McClenahan	850,670
Monkey wrench, ratchet, F. H. M. Davis	850,819
Mop wringer, J. L. Potts	850,781
Mortising gage, H. D. Jernigan	850,480
Motor, G. H. Chappell	850,295
Motor control system, C. R. Tatem	850,277
Motor controller, A. Pedersen 850,443,	850,872
Motor controlling apparatus, alternating current, W. N. Dickinson, Jr	850,630
Motor cut out, automatic, F. E. Case	850,211
Motors, automatic device for induction, S. R. Bergman	850,205
Musical instrument, mechanical, A. T. Chester	850,621
Musical instrument, pneumatically operated, J. J. Healy	850,366
Musical instrument, self-playing, E. D. Ackerman, et al	850,330
Musical instruments, expression mechanism for self-playing, J. J. Healy	850,303
Musical instruments, pneumatic valve for, A. W. Fiegel	850,635
Necktie, bow, W. A. Clarke	850,732
Nitrogen, oxidizing atmospheric, A. Neuburger	850,392
Non-hygroscopic compound and explosive treated therewith, A. La Motte	850,589
Nozzle, spraying, J. F. Dornfeld	850,216
Nut lock, L. H. Kennedy	850,432
Nut lock, W. Bartley	850,459
Nut lock, H. E. Marsch	850,665
Nut lock, G. W. Roberts	850,787
Nut lock, E. E. Smith	850,801
Oil engine, H. Soeldner, reissue	12,635
Ore concentrating table, H. D. McLeod	850,391
Organ key action, G. Binnig	850,413
Organs, adjustable combination action for, J. O. Funkbouser	850,828
Packing, piston rod, W. Hillman	850,159
Paint tube, T. Gotze	850,220
Panel board, metering, A. C. McWilliams	850,174
Paper bag machine, M. Schenck	850,605
Paper feeding machine, T. C. Dexter	850,821
Paper hanger's smoothing roller, C. T. Ridgely	850,317
Pasting device, S. T. Murchie	850,242
Pavements, surfacing, G. H. Lutz	850,382
Peeler and scraper, vegetable, S. Nagasse	850,871
Peeling fruits and vegetables, E. J. Judge	850,655
Peeling machine, vegetable, Franklin & Belding	850,424
Percolator, L. Wojidkow	850,710
Permutation lock, W. A. Matrolis	850,309
Phonogram, W. C. Runge	850,256
Photographic plate holder, P. Grassmann	850,429
Pianos, combined record making and self-playing attachment for, G. Mohr	850,668
Picture taking and exhibiting machine, Crosby & Pink	850,567
Pile driving and forming device, W. T. McClintock	850,389
Piling, sheet, Schuchart & Brown	850,496
Piling, sheet, P. A. Schuchart	850,497
Pipe. See Blowpipe.	
Pipe connection, J. M. Kiehle	850,230
Pipe coupling, Christensen & Tulloch	850,731
Pipe coupling, train, E. D. Piper	850,486
Pipe hanger, R. W. Clark	850,623
Pipe laying machine, M. S. Manning	850,238
Pipe, machine for manufacturing composition, E. F. Badgley	850,124
Pipe wrench, E. J. Robbins	850,254
Pipe wrench, M. Z. Viau	850,696
Piston head, J. C. Howard	850,583
Piston replacing device, C. J. Richardson	850,675
Planter and fertilizer distributer, combined, Purvis & King	850,249
Plate lifter, D. P. Dellinger	850,737
Plow, N. Jennings	850,162
Plow attachment, A. Arter	850,717
Plow, gang, G. W. Hammers	850,749
Pneumatic cushion, V. H. Podstata	850,181
Pneumatic spring, A. C. Mathee	850,387
Pool table attachment, F. W. Flint	850,360
Potato digger, J. Smith	850,682
Prepayment mechanism, J. E. Hubbell	850,755
Printing machine sheet delivery mechanism, T. M. North	850,313
Propeller, C. J. MacRae	850,383
Proportional meter, J. C. Anderson	850,457
Pulp washing apparatus, W. B. Klein	850,657
Pump, G. B. Petsche 850,178,	850,248
Punch, Steelham & Miller	850,803
Raft, life, P. C. Petrie	850,847
Rail adjuster, C. A. Jones	850,652
Rail clamp or fastening, J. G. Snyder	850,262
Rail joint, B. Wolhaupter	850,198
Rail joint, H. Spunaugle	850,269
Rail joint, J. C. Abbott	850,712
Rail joint, G. J. Miller	850,772
Rail system, guard, A. Morrison	850,536
Railway crossing, G. E. Starner	850,688
Railway frog switch, A. M. Lewis	850,660
Railway safety apparatus, G. E. Ryan	850,790
Railway switch, Chamberlin & Harrington	850,342
Railway switch, street, C. A. Ridley	850,318
Railway tie, J. P. Angell	850,283
Railway track construction, A. King	850,373
Rake, A. Jackson	850,228
Range lighter, gas, J. H. Robuck	850,852
Ratchet mechanism, H. J. Cook 850,347,	850,566
Razor blades, temporary holder for safety, D. A. Macbeth	850,767
Razor, safety, J. Reichard	850,183
Razor, safety, F. X. George, Jr	850,529
Receptacle, W. Sowerby	850,686
Reel, A. M. Maguire	850,236
Refuse can, T. Lee	850,167
Relay, C. E. Scribner	850,402
Retort closure, M. J. Campbell	850,133
Riding device, amusement, J. A. Cole	850,136
Riding gallery, A. J. Stickney	850,448
River banks, means for protecting, J. A. Nabers	850,244
Riveting machine, J. Bingham	850,615
Rock drilling machines or engines, means for mounting, Hellman & Bayles	850,885
Root and stalk pulling machine, J. L. Anders	850,715
Rotary engine, E. F. Taylor	850,450
Rotary engine, G. A. Whitman	850,555
Rotary motor, W. P. Marsh	850,593
Rubber erasers, tool for dressing, shaping, and cleaning, G. H. Blakesley	850,337
Rubber heels, resilient attaching means for, A. B. Heimbach	850,156
Rubber strips, apparatus for producing, J. F. Ott	850,485
Safe, pocket, C. Fisher	850,868
Safety lock, J. E. Ledford	850,840
Sanitary closet, J. W. Softley	850,263
Sash fastener, C. H. Miller	850,170
Sash lock, W. Schuch	850,495
Saw bench, F. A. Crum	850,351
Saw, hand, V. Lomoff	850,481
Saw handle, H. M. Walker	850,280
Sawmill feed mechanisms, belt tightener for, N. H. Warnock	850,698
Scaffolding and the like supporting bracket, E. Lorenz	850,662
Scale, automatic, W. E. Burks	850,729
Scale, weighing, G. Walker	850,508
Scissors, A. T. Eklund	850,632
Screen hanger, H. B. Higgins	850,369
Scriber and pencil holder, combined, T. B. Stephenson	850,189
Seat. See Closet seat.	
Section brake, J. Carr	850,730
Seed hulls, apparatus for treating cotton, D. L. Adelsperger	850,331
Self-luminous body, L. Vanino	850,860
Separating apparatus, material, A. C. Calkins	850,293
Separating or grading machine, C. F. Shumaker	850,447
Separator, W. I. Brock	850,417
Sewing machine, G. E. Gilbert	850,426
Sewing machine, T. D. Hamilton, et al	850,642
Sewing machine attachment, A. G. Rosenthal	850,789
Sewing machines, blindstitching, overseaming, and serging attachment for, E. Richter	850,851
Shade and curtain pole supporter, window, T. W. Brown	850,518
Shade and shade roller fixture, A. Hitt	850,578
Shaving apparatus, F. J. Halbekann	850,430
Ship bottom cleaning device, J. H. Pegram	850,246
Ships or vessels, transferring, F. Roeder	850,320

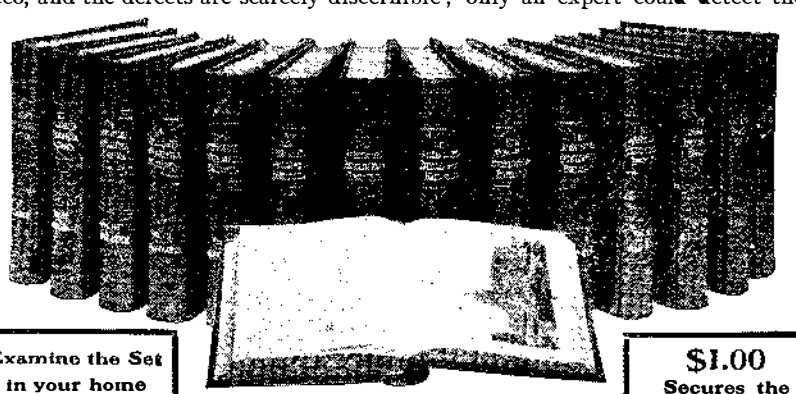
Constructive Watch Adjustment
When you buy an ordinary watch you actually purchase movement and case *separately*, the movement having been placed in a case not made for it and adjusted by means of the hairspring regulator. This is merely *regulative* adjustment and can not be compared in efficiency with the *constructive* adjustment of the
HOWARD WATCH
which is *completed* by the makers. After the movement is assembled it is tested and adjusted until absolutely accurate. *Then* it is placed in its own case and tested and timed for weeks. The slightest variation caused by casing is corrected by a complete readjustment.
To further protect it, every HOWARD Watch is enclosed in a velvet-lined mahogany cabinet, accompanied by Certificates of Guarantee giving the movement and case numbers, and the fixed price at which the watch is sold everywhere.
Howard Watches are made in men's sizes *only*. Prices range from $35 to $150, according to quality of case, number of jewels, and adjustments.
"Watch Wisdom" FREE
We want you to have a free copy of "Watch Wisdom," a mighty interesting book which tells more about time than you ever knew before. It's written by Elbert Hubbard. Write to-day.
E. HOWARD WATCH COMPANY
South St., Waltham, Mass., U. S. A.

EMBLEMS
FOR EVERY
FRATERNAL ORDER
DIRECT FROM FACTORY
I save you dealers' profits. I send an assortment of Emblems on approval to any Fraternal man in good standing in the United States, from which to make a selection. Write for an assortment, naming emblem desired and approximate price you wish to pay.
W. L. DODDS, 911 Ellicott Square, Buffalo, N. Y.

CONCRETE BUILDING BLOCK MANUFACTURERS
Reduce cost by my process, which allows you to cast "sloppy wet" blocks on dry process machines and remove at once. Double moulds waste the inner mould after each block is made. For full information, address
S. W. HENDRICKSON, Patentee, White Plains, N. Y.

THE ILLINOIS Fireless Cooker
Made entirely of Heavy Galvanized Iron. Safe. Sanitary, positively Roach and Vermin proof. No trouble. No odors. Perfection of Fireless Cookery. Send for details and Price List.
ILLINOIS HEATER CO., 3945 Wentworth Ave., Chicago

SENSATIONAL CLEARANCE SALE
OF SLIGHTLY RUBBED SETS
Of The New Americanized ENCYCLOPEDIA BRITANNICA
THE WORLD'S GREATEST WORK OF REFERENCE
These superb sets will bring delight to the Booklover. The bindings are fine half morocco, and the defects are scarcely discernible; only an expert could detect them.



Examine the Set in your home before buying
$1.00 Secures the Entire Work
THE New Americanized ENCYCLOPEDIA BRITANNICA
THIS IS YOUR CHANCE. The tremendous selling of the last few weeks has left us with a few sets on hand that are marked by trifling imperfections. Slight as these are, however (no more than would occur from a few weeks' use in your own bookcase) *we are compelled to dispose of them at a reduced price*, and thus give you the opportunity of securing the most wonderful book bargain of this generation. There are only a few sets left—to secure the advantage you must order immediately.
THIS WORLD-FAMOUS WORK is the product of three hundred of the finest brains in America. With the original Britannica as a foundation they have added, condensed and improved until this magnificent work constitutes the most authoritative, comprehensive, and up-to-date encyclopedia in the world. Its stores are inexhaustible. Every man of force and fame that ever lived, every step in human progress, all inventions, discoveries, statistics, right up to 1906—are found in the 10,000 teeming pages of these splendid volumes. Can *you* afford to do without it?
$1.00 Secures Possession of the Entire Set. Nothing is required in advance. You send for the books—you get them—you examine them. Then, when you are convinced that they are the greatest book bargain of recent years, **you forward $1.00** to open your contract, and $2.00 monthly thereafter until you pay $38. THE REGULAR PRICE OF THESE BEAUTIFUL HALF MOROCCO SETS IS $75.
NO CHARGE FOR EXAMINATION. But—if you use the attached coupon for your application—not a cent is required until you have examined the books and seen for yourself the excellence of this offer. Mail the Coupon at once. The New Americanized BRITANNICA is a phenomenal value—even at $75; and at this sweeping reduction (for sets on which wear or discoloration is scarcely noticeable) you are offered a bargain you will never again have a chance to secure. *No obligation rests on you.*
We pay all transportation charges. If you decide not to purchase, return the books at our expense.
If you like the books you will have immediate possession thereof. You can then pay just one dollar and the balance a little each month.
SIEGEL COOPER CO., New York
THIS COUPON GIVES YOU FREE EXAMINATION PRIVILEGE
Scientific American 4, 27, '07
Siegel Cooper Co., New York N.Y.
Send on approval, prepaid, a complete set of the New Americanized Encyclopedia Britannica in half morocco binding at the special price of $38.00. If the set is satisfactory I agree to pay thereon $1.00 as Club fee within 5 days after the receipt of goods and $2.00 each month thereafter for 19 months. Title to remain in Siegel Cooper Co. till the full purchase price has been paid. If the books are not satisfactory I am to notify you, and hold them subject to your order.
Name.....
Address.....

Classified Advertisements

Advertising in this column is 50 cents a line. No less than four nor more than ten lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

BUSINESS OPPORTUNITIES.

TO INVENTORS, Patent Agents, Manufacturers, and others.—J. E. Garratt, 96 Southwark St., London, S. E. and 1133 Broadway, New York, U. S. A., maker and proprietor of the Veedee Vibrator and other similar important patented articles, having unique organization and facilities through his own branches and agencies throughout the world for marketing articles of Domestic Hygiene class, Health Apparatus, Athletic-hygienic Apparatus, and novelties generally, invites correspondence. I also want a manufacturer (good class metal work) for the Veedee in U. S. A. Address (in Europe), 96 Southwark Street, London. Address (America), 1133 Broadway, New York.

PATENTS SOLD ON COMMISSION.—If you wish to buy or sell a patent write for particulars to E. L. Perkins, 72 Broad Street, Boston. Patent Sales Exclusively.

WANTED. — Used filter press of 500-1,000 pounds capacity, modern system; must be in good working condition. Answer with full particulars P 1,000, Box 773, New York.

AGENTS WANTED to sell best kettles in world for cooking, steaming, straining food of all kinds. No more burned or scalded hands, no more food wasted. Sample free. For particulars write American Specialty Stamping Co., Johnstown, Pa.

ATTORNEYS AND INVENTORS, ATTENTION! Practical course by mail—Patent Laws and Office Practice. Free booklet and specimen pages. Cor. School of PatentLaw, Dept. A, 1883 Mintwood, Wash., D. C.

WE WILL MANUFACTURE FOR YOU, on reasonable basis, specialties in Electrical, Hardware or Metal lines. Large quantities or continuous contracts desired. Forest, Box 1736, New York.

PATTERN LETTERS AND FIGURES (White Metal and Brass) for use on patterns for castings. Large variety, prompt shipments. Send for catalog. H. W. Knight & Son, Seneca Falls, N. Y.

METAL NOVELTY WORKS CO., Manufacturers of all kinds of light Metal Goods, Patented Articles and Hardware Specialties on contract. Metal Stamping Dies and Stamping our specialty. 43-47 Canal St., Chicago.

I SELL PATENTS.—To buy or having one to sell, write Chas. A. Seale, 719 Mutual Life Building, Buffalo, N. Y.

INCORPORATE YOUR BUSINESS. Over sixteen hundred charters procured for my clients. Write for corporation laws, blanks free, to former Ass't Secretary of State, Philip N. Lawrence, Huron, South Dakota.

SALE AND EXCHANGE.

A 1903 EIGHT H. P. CADILLAC TOURING CAR. In fair condition, with lamps and tires. Price $125. For further information address J. W., Box 773. New York City.

A SMALL MANUFACTURING PLANT.—Lease, new 10 horse power gas engine, perfect condition; shafting, air compressor and pneumatic hammer; all for sale. Sanford & Bennett, 18 Spruce Street, New York.

HELP WANTED.

A LARGE AGRICULTURAL IMPLEMENT FACTORY inteuds to improve their shop system, especially as it relates to stock records of raw material and finished product—tracking the material as it moves from one department to the other in the process of manufacture, with due regard to proper schedule whereby full sets of parts necessary to assemble machines will go through on time—and desires to correspond with parties who are thoroughly familiar with the work. Book-keepers, correspondence school system experts, and card system cranks need not apply. What is wanted is an expert with practical shop experience and a record of having done things. All correspondence will be strictly confidential. Address D-54, Room 1300, Trude Building, Chicago.

DO YOU WANT INFORMATION FROM WASHINGTON? If so, write Josiah H. Shinn, Special Investigator, Bliss Bldg., Washington, D. C. Congressional, Departmental, Statistical, Economical. Commissions taken to furnish information regularly.

WANTED.—A SUPERINTENDENT.
Syracuse Chilled Plow Co.,
Syracuse, N. Y.

WANTED.—2,000 young men for Policemen, Firemen, Chauffeurs, Clerks. Positions guaranteed or tuition refunded. O'Brien's Civil Service School, 355 6th Ave., City; 15 Myrtle Ave., B'klyn; Phone 4594 Chelsea.

ENGINEERS—Mechanical, Civil, Electrical, Stationary—wanted for some of the 20,000 employers we serve. Salaries $1,000-$5,000. Write us to-day, stating experience. Hapgoods, 305 Broadway, New York.

FACTORY AND MILL SUPPLIES.

FACTORIES, CUT DOWN YOUR INSURANCE by putting in a Caldwell Tank and Tower for fire protection. Once up, no further expense. Endorsed by all insurance companies. References in every section. Arkay Stave Co., of Columbus, Miss., says: "Saves us $20 a month." Illustrated Catalogue and Price List free. W. E. Caldwell Co., Station D D, Louisville, Ky.

MACHINERY.

REMOVED to larger quarters, we offer our large stock of new and second-hand machinery; also boilers, engines, dynamos, motors, materials and supplies. Liberty Machinery Mart, 153 West Street, New York.

TYPEWRITERS.

TYPEWRITERS.—Sold, rented, and repaired. Expert repairing on all makes. High grade machines at lowest prices. All makes rented. Henry Typewriter Exchange, 54 W. 125th Street, New York. Telephone 4652.

STANDARD MAKES BETTER THAN NEW at prices as low as anywhere. Thoroughly overhauled and rebuilt machines at 1-3 manufacturers' prices. Atlantic Typewriter Exc., 246 B'way, N. Y. Reliable repairing. Telephone 6828 Cortlandt.

CLEARANCE SALE—Remingtons, Densmores, Jewetts, Blickensderfers, Williams, $12.50; Postals, Hammonds, $10; Underwoods, Olivers, $35. Orders filled or money back. Standard Typewriter Exch., Suite 45, 231 Broadway, N. Y.

PHOTOGRAPHY.

BARGAIN TIME IS HERE. Splendid opportunity in high grade lenses and cameras. If you want to buy, sell or exchange, write us for lists. National Specialty Co., 49 W. 28th St., New York City.

ALL CAMERA USERS should subscribe for the *American Amateur Photographer and Camera and Dark Room*, monthly, 15 cents, $1.50 per year. Monthly competitions, illustrated articles, picture criticism, answers to queries. Am. Photo Pub. Co., 361 B'way, New York.

PATENTS FOR SALE.

WILL SELL OUTRIGHT or on royalty basis valuable patent for an article greatly in demand and which can be marketed with a moderate amount of capital. Nothing on the market to compare with it. Chas. S. Moore, Fort Pierce Florida.

WATER FILTER.

THE DUPLEX FILTER is positively hygienic, because it is self-cleaning. Leased by 250 physicians, 4 hospitals, thousands of private families. Rent, 2 cents per day. Duplex Filter Co., 1140 Broadway, New York.

AGENTS WANTED.

MACHINISTS, ELECTRICIANS, PRINTERS, IRON-Workers, Plumbers, Engineers, Motormen, Chauffeurs order Kleanal for clean hands. Removes machine grease, grime, paint, printers' ink and dyes. Good garage side line. Continental Supply Co., 53 W. 24th St., N. Y.

MOTION PICTURES.

MOTION PICTURE MACHINES. Films, Slides and Supplies from the largest store of its kind in this city. Sole agent Power's Cameragraph the real fireproof machine. Catalogs. Lewis M. Swaab, 336 Spruce St., Phila.

THE MOVING PICTURE WORLD, weekly, 10 cents per copy; yearly subscription, $2. The only paper devoted to the moving picture, illustrated song and lantern lecture field. Moving Picture World, Box 450, N. Y.

EYE-GLASS SPECIALTIES.

REMARKABLE MAGNETIC SPECTACLE AND EYE GLASS OFFER. Send stamp, no postals, for Free Pair, coupon and testimonials. S. A. Fredrick Optical Co., Toledo, Ohio.

EXPERIMENTAL ELECTRICS.

STUDY ELECTRICITY AT HOME. Complete course, 30-pg. detail-book, 220-pg. text-book, 200 experiments, over 100 pieces of apparatus. Only $5.00. Bulletin "A 8" explains. Thomas M. St. John, 845 Ninth Ave., N. Y.

SCHOOLS AND COLLEGES.

GEO. H. WILSON, the World's Champion, has written a booklet, "Vaudeville, Stage Dancing and Entertaining." It is absolutely free and very interesting. Just address Wilson's Vaudeville School, 263 W. 42d St., N. Y.

Shock absorber, F. W. Battershall 850,460
Shock binder, A. Melin 850,843
Shoe, arch supporting, H. C. Welch 850,862
Shoe cleaning device, J. J. Polt 850,396
Shoe upper holding device, J. S. Hansen 850,884
Shuttle, F. Ott, reissue 12,634
Sign, illuminated, C. L. Carter 850,521
Signaling system, train, J. S. Anderson 850,511
Skins and hides, scudding, K. A. Ernst 850,146
Skirt, C. J. Sorensen 850,264
Skylight, J. Flynn 850,361
Skylight structure, W. F. Plass 850,487
Slack adjuster, C. O. Anderson 850,202
Sled, automobile, J. M. Lambert 850,763
Sleeve holder, H. M. M. Barnes 850,721
Slipper for soaking the feet, G. Reiter 850,603
Sluices, device for automatic regulation of outlet, I. F. Wessely 850,703
Smut machine, O. L. Larson 850,378
Snap hook, W. H. Lambert 850,234
Snap hook, D. E. Barton 850,512
Soldering iron, self-heating, Marvell & Ashman 850,385
Soldering iron, self heating, R. W. Marvell 850,386
Sound box, E. D. Gleason 850,883
Spectacle temple, detachable, N. A. Bowen 850,130
Speed indicator, T. W. Flory 850,745
Spike, O. M. De Witt 850,421
Splint, adjustable, J. R. Ward 850,610
Spool holder, M. Halsted 850,641
Sprayer, compressed air, C. W. & E. A. Parks 850,674
Spring wheel, S. S. Childs 850,134
Spring wheel, J. D. Sower 850,265
Stacker, hay, L. J. Lindsay 850,765
Stacks, covering for hay and the like, O. Novak 850,672
Stamping and numbering machine, J. French 850,425
Stamps, cushioned holder for dating, E. Ensign 850,471
Stapling machine, T. A. Briggs 850,290
Station indicator, T. J. O'Neill 850,673
Stave jointing machine, A. Dunbar 850,144
Steam generator, J. M. Story 850,191
Steam, mechanism for utilizing superheated, C. de Loewenstein 850,380
Steering gear, L. H. Dyer 850,145
Sterilizing and preserving substance, A. Schroeder 850,606
Stock leader, J. Gibson 850,640
Stone, manufacturing artificial, J. Staudt 850,689
Stool, counter, W. G. Winans 850,453
Stove or furnace, E. J. Selley 850,200
Stove or furnace attachment, L. D. Mohler 850,171
Strainer, julep, T. B. Lashar 850,379
Stump puller, J. W. Folgert 850,362
Sulfur dioxid, apparatus for nitrating, P. J. Berrig 850,820
Superheater, F. J. Cole 850,565
Suspender or holder, garment, F. Spaninger 850,405
Suspensory, F. F. De Mars 850,288
Switch lock, F. B. Bradley 850,207
Switch operating device, E. J. Rice 850,604
Tab for sheets or ledgers, etc., E. Davis 850,140
Table. See Ore concentrating table.
Tailor's appliance, M. J. Brosnahan 850,340
Tape or band, woven, A. Weimar 850,702
Tapping device, liquid, E. H. Weatherhead 850,410
Telegraph, emergency, M. C. Tunison 850,858
Telegraph line, duplexing, I. Kitsee 850,305
Telegraph transmitter, keyboard, G. M. Goddard 850,364
Telegraphy, I. Kitsee 850,231
Telephone attachment, M. H. Black 850,558
Telephone apparatus, K. Kohn 850,433, 850,434
Telephone attachment, D. G. Hobby 850,886
Telephone exchange system, E. E. Clement 850,344
Telephone trunking system, W. W. Dean 850,470
Telephones, reinforcing, C. Newman 850,484
Thill coupling, R. D. Seibert 850,259
Thio-indoxyl derivative and making same, P. Friedlaender 850,827
Threads, films, and the like, manufacturing artificial, E. W. Friedrich 850,571
Thresher feeder, T. N. Johnsen 850,838
Tile, G. B. Staples 850,271, 850,272, 850,274
Tile machine, W. H. Beery 850,513
Tile or stair tread, G. B. Staples 850,273
Tiling, G. B. Staples 850,275
Timber cutting device, E. C. Pollard 850,848
Time recorders, automatic card stop for, J. & A. Dey 850,526
Tin and solder, apparatus for recovering, J. H. Bills 850,726
Tire armor, C. A. Schlachter 850,321
Tire bolting machine, A. H. Wilson 850,809
Tire fastener, rubber, Giles & Tobey 850,748
Tire protector, rubber, J. A. Posey 850,488
Tires, means for inflating pneumatic, A. A. Withers 850,706
Tires to wheel rims, manufacture and application of rubber, Giles & Tobey 850,747
Tobacco pipe, J. Shields 850,404
Tobacco pipe, E. Kneezell 850,761
Toilet article, Wagner & Herne 850,551
Tongs, nail, G. E. Smith 850,547
Tongs, shelf, B. L. Ward 850,409
Tongue regulator, J. A. Kearney, reissue 12,633
Tool, combination, W. E. Robinson 850,319
Torpedo, railway signal, C. E. Beckwith 850,724
Torpedoes, composition for railway, F. Sparre 850,406
Toy blocks, nested, J. H. Price 850,490
Toy train, A. W. Benson 850,514
Tramway switch, R. H. Carlisle 850,294
Transformer, Allen & Bergman 850,714
Transformer, W. J. Woolridge 850,863
Trap, H. Yturri 850,510
Trap, W. E. Maull 850,666
Trap, holder, and chute for live stock, combined, W. E. Willhoit 850,197
Trolley stand and pole, C. Q. Seaman 850,796
Truck, G. A. Browne 850,562
Truck, lumber, G. A. Browne 850,563
Trucks of cars and the like, appliance for shifting the point of application of the weight on the, P. Steffee 850,804
Tube compressors, shut off for, E. O. Jeralds 850,371
Tube or bar straightening machine, Worth & Harrison 850,810
Tufting machines, button protector for, W. E. Buser 850,816
Turbine, F. T. Snyder 850,501
Turbine bucket and nozzle, K. Ahlquist 850,200
Turbine, elastic fluid, H. P. R. L. Porscke 850,397
Turbine motor, W. A. Warman 850,196
Turner's tool, J. H. Tripp 850,874
Twine reeling machine, A. J. Crandall 850,734
Typewriter cover, office folding, G. R. Bright 850,289
Typewriting machine, G. H. Smith 850,187
Typewriting machine, H. S. McCormack 850,310
Typewriting machine, E. F. Kunath 850,839
Typewriting machine, J. C. McLaughlin 850,846
Typewriting machine, H. S. McCormack 850,890
Umbrella, P. J. Callahan 850,341
Umbrella attachment, C. A. Piltz 850,544
Umbrella rib holder and runner, W. W. Ream 850,445
Valve, A. L. Dow 850,740
Valve device, J. Binnig 850,812
Valve, electrically operated, J. T. H. Dempster 850,738
Valve for steep tanks, J. F. Dornfeld 850,215
Valve for water gages, check, C. E. Miser 850,483
Valve gear, gas engine, M. A. Neeland 850,175
Valve, safety, W. H. Creighton 850,626
Vanner, G. O. Bradley 850,415
Vaporizing device for lubricants, W. P. Maingault 850,771
Vehicle, F. Eder 850,300
Vehicle, H. D. Smith 850,500
Vehicle brake, E. Hoffman 850,225
Vehicle brake, R. F. Armstrong 850,284
Vehicle emergency brake, D. F. & H. H. Greaser 850,302
Vehicle jack, A. Gordon 850,830
Vehicle running gear, P. Richardson 850,783
Vehicle spring, pneumatic, Podstata & Preucil 850,180
Vehicle top shifting rail lock, J. D. Pilgrim 850,600
Vehicle wheel, J. E. Foley 850,636
Vehicle wheel, E. A. Fountain 850,637
Vehicle window, H. Heidemann 850,834
Vehicles, dust collector for wheeled, J. M. Weaver 850,708
Ventilating apparatus, H. S. Richmond 850,784
Ventilating lock, automatic, J. C. Foster 850,147
Ventilator, Hodge & Douglas 850,160
Vibratile apparatus, L. Snyder 850,188
Vibrator or hammer, pneumatic, W. Lewis 850,592
Violin, I. A. Northrop 850,393
Vise, hydraulic, H. D. Bright 850,865
Wagon, dumping, R. A. Showers 850,799
Wagon, extensible, E. Riedinger 850,785
Waist protector, dress, J. R. Brantly 850,560
Wardrobe, portable, M. S. Koonce 850,658
Washing machine, Brucker & Stump 850,291
Washing machine, C. C. Davis 850,524
Washing machine, J. S. Parrish 850,539
Watch guard, P. B. Smith 850,261
Watch guard, R. S. Pope 850,601
Water by ozonized air, means for purifying and sterilizing, J. H. Bridge 850,416
Water gap, P. Schafer, Jr 850,791
Water heater, Fessler & Michaels 850,634
Water tube boiler, W. S. Elliott 850,358, 850,423
Wave motor, A. L. & G. A. Reynolds 850,492
Wedge splitting and shaving machine, F. B. Schuyler 850,546
Weeder, R. D. Abraham 850,456
Weighing attachment for ice boxes, N. S. Mercer 850,169
Wells, hoisting apparatus for deep, W. S. Sutton 850,549
Wheel. See Current wheel.
Wheel, C. C. Brabant 850,559
Wheel, J. W. Hill 850,754
Whiffletree draft attachment, H. Lambert 850,377
Whip socket, P. I. Conrad 850,466
Winding machine, quill, E. E. Bradley 850,463
Windmill, Dempster & Molony 850,628
Wrench, N. W. Rasnick 850,315
Wrench, C. D. Bradstreet 850,516
Wrench, J. R. Hunt 850,756
Wrench, C. M. C. Kirk 850,760
Wrench, E. Huntley 850,869
Yarn slug or bunch catcher, T. J. Sands 850,400

DESIGNS.

Bag, hand, H. Grossman 38,525, 38,526
Picture frame molding, H. A. Aronson 38,527
Radiator, E. Sjoden 38,528
Spoon or fork, C. A. Bennett 38,524
Stove, B. B. Cohen 38,529
Stove, cooking, J. S. Van Buren 38,530, 38,531

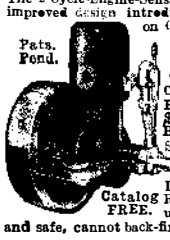
TRADE MARKS.

Antiseptics, disinfectants, and germicides, E. Bischoff 62,091
Balls, golf, A. G. Spalding & Bros 62,085
Beef, fluid, Patterson-Cabell Co 62,046
Blue, laundry, Hargreaves Bros. & Co 62,095
Boots and shoes, leather, Vinsonhaler Shoe Co 61,976
Boots and shoes, leather and canvas, Peoples Shoe Co 61,973
Boots and shoes, men's leather, Huckins, Temple & Wood 61,972
Boots, felt, W. B. Cosgrave Shoe Co 61,977
Boots, shoes, and slippers, leather, A. De Pinna Co 61,970
Bows, arrows, and targets, H. N. Andersen 62,100
Brandy, Girard & Co 62,003
Brandy, cordial, whisky, and gin, Liebenthal Bros. & Co 61,993
Brooms and whisk brooms, Lee Broom & Duster Co 62,116
Butter, D. W. Lewis & Co 62,056
Candies, J. P. Laskaris & Co 62,114, 62,115
Canned lobster, H. C. Baxter & Bro 61,989
Canned salmon, shrimp, lobsters, etc., Downing Taylor Co 62,063
Cheese, C. C. Martin 62,007
Chemical compound, J. A. & W. Bird & Co 62,090
Chocolate and cocoa, Pennsylvania Chocolate Co 61,996
Cigars, J. H. Johnson 62,005
Cigars, L. G. Smith & Co 62,078
Clothing, certain, W. Read & Sons 62,093
Coats, vests, and trousers, Bickley, McClure & Co 62,103
Coffee, Woolson Spice Co 62,083
Coffee, Yerxa Bros. & Co 62,084
Cutlery, certain, Paxton & Gallagher Co 62,010
Detergents, certain, Percela Company 62,097
Dyes, Farbwerke vorm. Meister Lucuis & Bruning 62,108
Dyestuffs, coal tar, Actien-Gesellschaft fur Anilin-Fabrikation 62,086
Dyestuffs for coloring and printing, Farbwerks vorm. Meister Lucius & Bruning 62,109
Explosives, high, Eastern Dynamite Co 62,978
Explosives, high, Judson Dynamite & Powder Co 61,979
Fence, wire, Keystone Fence Co 62,025
Finger nail clippers, H. C. Cook Co 62,067
Fishing tackle, assorted, F. E. Chester 62,093
Flat iron pads, Laundry Novelty Co 62,073
Floor scraping machines, Hurley Machine Co 62,024
Flour, wheat, C. H. Bishop Flour Co 61,990
Food, poultry, Albert Dickinson Co 62,017
Food, wheat breakfast, Pillsbury-Washburn Flour Mills Co 62,011, 62,012, 62,077
Grass hooks, Wiebusch & Hilger 62,082
Hair pins, S. H. Goldberg 62,053
Hair restoratives, F. M. Quinn 62,057
Hardware, saddlery, Eberhard Manufacturing Co 62,001
Harmonicas, mouth, F. A. Bohm 62,092
Hats, stiff felt, N. P. Hill 62,068
Hooks, snap, Covert Mfg. Co 62,000
Insulators, porcelain, George Cutter Co 61,992
Iron and lithia water, Dawson Salts & Water Co 61,991
Jellies, S. B. Stone 62,080
Jewelry and precious metal ware, certain, A. Edholm 62,002
Knitted hosiery, gloves, and underwear, M. S. Esche 62,064, 62,094, 62,106
Lamps, incandescent electric, Sunbeam Incandescent Lamp Co 62,015
Lard substitute, Miner, Read & Garrette 62,042
Leather, Pfister & Vogel Leather Co 61,974
Leather manufactures, certain, J. J. Pigott 61,975
Leather, oils, greases, and waxes for, Vacuum Oil Co 62,124
Lighting fixtures, certain, Cleveland Gas & Electric Fixture Co 62,105
Linen goods, certain, L. F. Keller 62,006

SKIDOO!

MARINE ENGINE

The 2-Cycle-Engine-Sensation of the Year. Entirely new and improved design introducing many exclusive features. Runs on Gasoline, Distillate, Kerosene or Alcohol.



Pats. Pend.

2 H. P. ACTUAL Bare Engine $23

COMPLETE ENGINE with Fresh Water Boat Fittings $39.90; With Salt Water Boat Fittings, $43.90.

Swiftest, most powerful, efficient and reliable engine of its size on earth. Drives Canoe. Rowboat or 14 to 20 ft. Launch with load, 6 to 10 miles per hour. Reversible, easy to install and operate, unfailing endurance powers, economical and safe, cannot back-fire. Sold under Five Year Guaran ee.

Catalog FREE.

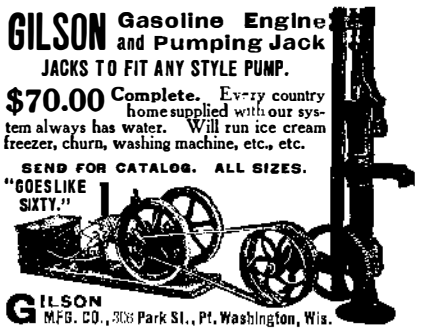
Belle Isle Motor Co., Dept. 18, Detroit, Mich.

GILSON Gasoline Engine and Pumping Jack

JACKS TO FIT ANY STYLE PUMP.

$70.00 Complete. Every country home supplied with our system always has water. Will run ice cream freezer, churn, washing machine, etc., etc.

SEND FOR CATALOG. ALL SIZES.



GILSON MFG. CO., 308 Park St., Pt. Washington, Wis.

The Dayton Sprayer and Whitewasher

Covers 10,000 sq. feet of surface per day with whitewash, cold water paints or disinfectants. Used by farmers, tobacco growers, horticulturists, for watering, destroying insect pests or plant diseases.

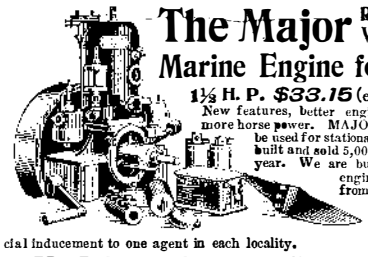
Easily operated, developing high pressure for extinguishing fires, washing vehicles, etc.—will last a lifetime. Write for catalog of other kinds and prices.

The "Progress" 12 gal.—$21.00 20 gal.—$30.00 including hose, etc.

Dayton Supply Co. Dept. R, Dayton, Ohio.

The "Climax" On legs $10.50 On Bbl. $12.95 Including hose, etc

BABBITT METALS.—SIX IMPORTANT formulas. SCIENTIFIC AMERICAN SUPPLEMENT 1123. Price 10 cents. For sale by Munn & Co. and all newsdealers. Send for catalogue.



The Major Reversible Valveless Marine Engine for 1907

1½ H. P. $33.15 (engine only)

New features, better engine, stronger, more horse power. MAJOR engine can be used for stationary work. We built and sold 5,000 engines last year. We are building 10,000 engines this year, from 1 1-2 to 20 H. P. Write at once for catalog and special inducement to one agent in each locality.

DETROIT GAS ENGINE AND MACHINERY CO.
58 E. Congress Street, Detroit, Mich.

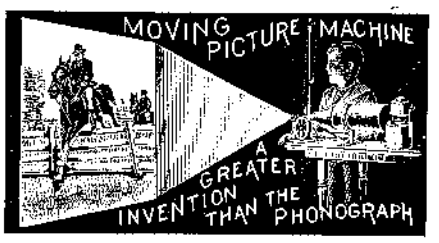
To Book Buyers

We have just issued a new 112-page catalogue of recently published Scientific and Mechanical Books, which we will mail free to any address on application.

MUNN & COMPANY
Publishers of SCIENTIFIC AMERICAN
361 Broadway, New York

GENUINE MOVING PICTURE MACHINE OFFER

BOYS AND GIRLS—ENJOY YOURSELVES AND MAKE MONEY



This illustration shows an actual Moving Picture Machine, made expressly for home use, simple of construction, easily manipulated by Boys or Girls.

IT IS A GREATER INVENTION THAN THE PHONOGRAPH.

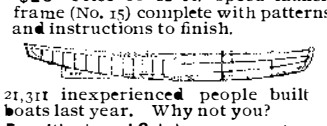
My young friends, I want you, every one of you, to have one of these MOVING PICTURE MACHINES, and I have arranged a plan whereby you can get it without cost. If you will send me your name and address on a postal card, I will send you 28 of the handsomest pictures you ever saw. These pictures are beautifully printed in colors and at the art stores sell for many times 25 cents. Everyone will instantly buy one for the small sum of 25 cents, or two for 50 cents. When you have sold them return to me the $7.00 you have collected and I will immediately send you a MOVING PICTURE MACHINE, all complete—even to a film to reproduce the pictures—and you will certainly be the envy of your entire neighborhood. They are new. No other boy or girl has one, and I have the sole right to give them away in the United States, so be the first in the field. Send me a postal card today. Remember, I do not ask for any money in advance. I will trust you with the 28 beautifully colored pictures. All you will have to do is to sell them and you will soon be the owner of one of these WONDERFUL MOVING PICTURE MACHINES. Address CHARLES E. ELLIS, 649 WEST 43d ST., DEPT. D.S., NEW YORK CITY.

BUILD YOUR OWN BOAT

By the Brooks System of full size patterns and illustrated instructions.

Patterns of all Rowboats and Canoes, $1.50 to $2. Launches and Sailboats, 20 feet and under, $4 to $5. From 21 to 30 feet inclusive, $5 to $10.

We sell frames with patterns to finish for less than it costs others to manufacture. $15—Price of 16 ft. launch frame (No. 5) complete with patterns and instructions to finish. $20—Price of 22 ft. speed launch frame (No. 15) complete with patterns and instructions to finish.



21,311 inexperienced people built boats last year. Why not you?

Free Illustrated Catalogue quotes prices on other patterns, knock-down frames with patterns to finish, and complete knock-down boats—launches, sailboats, rowboats and canoes. Satisfaction guaranteed or money refunded.

BROOKS SYSTEM

BROOKS BOAT MFG. CO.
Originators of the Pattern System of Boat Building
104 Ship St., Saginaw, Mich., U.S.A.

Every reader of the SCIENTIFIC AMERICAN should also be a reader of

Technical Literature

A Monthly Review of Current Technical Publications

a large 64-page illustrated journal giving its readers, in more or less condensed form, the BEST literary material of general interest appearing in the current technical publications of America and Europe, as well as much valuable information found in daily papers, trade pamphlets, society proceedings, speeches and lectures, etc. The

"Index to Articles in Current Technical Periodicals"

gives a classified descriptive listing of all the articles of importance appearing in the current technical press, brought down to the first of the month of issue.

"An indispensable publication for engineers and other technical men, and one of the most instructive ever published for general readers who wish to keep in touch with modern industrial progress."

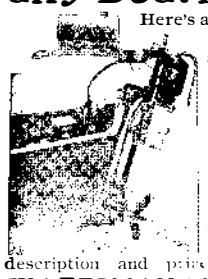
SUBSCRIPTION RATES
$2.00 a Year. Single Copies, - - 20 Cents

Special Offers to Readers of the Scientific American.—As a trial subscription we will send you TECHNICAL LITERATURE for two months for 25 CENTS with a low rate in combination with a special Premium Book Offer for the continuance of the subscription.

Send your quarter to-day and get the current numbers.

TECHNICAL LITERATURE, 19 S, 220 Broadway, New York

Make a Motor Boat of any Boat in 5 Minutes



Here's a little, 2 h. p. marine motor (40 lbs. complete) that you can attach to the stern post of your boat in 5 minutes without any tools. Drives an 18-ft. row boat 7 miles per hour (runs 8 hours on one gallon gasoline). Can be detached from boat just as quickly and stored in box in which it is carried. Simplest motor made—does not get out of order. Write for catalog with full description and price.

WATERMAN MARINE MOTOR CO.
1509 Fort St. West, Detroit, Mich.

BUILD A BOAT

By the WEATHERWAX METHOD.

We are the only boat builders who will ship you Knock-down frames easily put together. The best boat building book ever published—our 100-page Catalog J of 1907 models.

BAY CITY BOAT MFG. CO., Bay City, Mich., U.S.A.

LET US ESTIMATE ON YOUR MOTOR BOAT OR LAUNCH

New Factory. Perfect Equipment. Testing Basin. River Connected. Expert Service. Competitive Prices. Write for Facts.

WECKLER BOAT CO.
222-226 W. Irving Park Boulevard (and the River), CHICAGO

60 YEARS' EXPERIENCE

PATENTS

TRADE MARKS
DESIGNS
COPYRIGHTS &C.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. HANDBOOK on Patents sent free. Oldest agency for securing patents.

Patents taken through Munn & Co. receive *special notice*, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.

MUNN & Co. 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

Machinery, certain, Societe Anonyme de Fondations par Compression Mecanique du Sol	61,998
Malt extract, Malt-Diastase Co.	61,995
Matches, Ohio Match Co. ..... 61,985 to	61,987
Medical preparation, certain, H. G. Thompson	62,081
Medicinal oil, Stallman & Fulton Co.	62,079
Medicinal preparation, certain, Medical Food Co.	62,075
Medicinal preparations, certain, Actien-Gesellschaft fur Anilin-Fabrikation	62,034
Medicinal preparations, certain, J. W. James Co.	62,055
Medicinal preparations for the skin, Actien-Gesellschaft fur Anilin-Fabrikation	62,033
Medicine, certain proprie ary, U. G. Heshaw	62,040
Medicines, certain, E. Bischoff	62,048
Medicines, certain, F. E. Rutherford	62,122
Milk and cream, evaporated and condensed, Mohawk Condensed Milk Co. 62,043,	62,044
Milk and evaporated cream, condensed and evaporated, Borden's Condensed Milk Co.	62,062
Milk, condensed, Wisconsin Condensed Milk Co. 62,031,	62,032
Milk, preparation for the modification of, Fairchild Bros. & Foster	62,065
Newspaper, It Publishing Co.	62,112
Oil, salad, Vacuum Oil Co.	62,016
Oils and greases, lubricating, Kathaire Chemical Co.	62,096
Paints, roofing, Black Diamond Manufacturing Co.	62,018
Paper, wrapping and printing, McClellan Paper Co.	62,118
Peaches, fresh, J. M. Hampton	62,038
Pens, fountain, F. H. Mooney	62,119
Perfume, W. W. Gavitt Chemical Co.	62,037
Perfumery, talc powder, and toilet water, Colgate & Co.	62,050
Periodical, weekly, Wilson Co.	62,099
Periodicals, bulletins, and directories, J. R. Kendrick	62,113
Photographic developers, Actien-Gesellschaft fur Anilin-Fabrikation	62,087
Pianos, mandolins, guitars, etc., C. J. Heppe & Son	62,110
Powder, Laflin & Rand Powder Co., ... 61,980 to	61,988
Powder and massage cream, talcum toilet, E. Atwell	62,101
Powders, headache, P. Boehme	62,104
Preparation for treating venereal diseases, Benkocine Chemical Co.	62,049
Prunes, dried and evaporated, H. S. Gile & Co.	62,066
Razors, C. F. Butcher	62,019
Remedies for disorders of the blood, W. H. Server	62,059
Remedies for skin diseases, K. Drinkard	62,051
Remedy, dyspepsia, Pittsburg Pharmacal Co.	62,047
Remedy for certain diseases, Booth's Hyomei Co.	62,035
Remedy for certain diseases, S. M. Marsh	62,041
Remedy for rheumatism and gout, Butler & Field	62,036
Remedy, headache, Dr. Kilmer & Co.	62,072
Salt, Schwabacher Bros. & Co.	62,123
Salts, cell and tissue building, J. W. Hine	62,111
Seed distributing machines, E. F. Molck	62,008
Seeds, garden, D. Hardie Seed Co.	61,971
Serums, antitoxic, Schimmel & Co.	62,058
Shirts, dress and negligee, D. Moses	62,009
Soap, laundry, H. Bick	62,061
Soap, medicated, Lloyd Brothers	62,074
Soap, perfumed and medicated, H. S. Kelley	62,071
Soap, toilet, D. Estes	62,107
Starch, laundry, Atlantic Starch Works	62,088
Steel and iron bars, sheets, etc., Cammell Laird & Co.	62,021
Steel and iron in bars, sheets, rails, etc., Cammell Laird & Co.	62,020
Stockings, Tefft, Weller Co.	62,029
Thread, cotton, Clark Thread Co.	62,022
Thread, cotton, New England Cotton Yarn Co.	62,120
Thread or crochet cotton, cotton, Clark Thread Co.	62,023
Tiles, floor, W. H. Watts & Co.	62,098
Tobacco, smoking, J. G. Saffa	62,014
Toffee Mackintosh's Toffee Co.	62,117
Valves and cocks and parts thereof, H. Mueller Manufacturing Co.	62,076
Varnish, Berry Brothers	62,060
Vaults, burial, E. A. Benner	62,102
Wall board and building paper, Beaver Manufacturing Co.	62,089
Washing powder, Hollywood Soap Co.	62,069
Watch cases, Elgin National Watch Co.	62,052
Watches, table, J. Ries 61,997,	62,027
Welsh rarebit seasoning compound, D. R. Greene	62,004
Whisky, Breen & Kennedy	61,999
Whisky, F. S. Scherer	62,028
Whisky, Wichman, Lutgen & Co.	62,030
Whisky, John Haig & Co.	62,039
Whisky, Imperial Distilling & Cordial Co.	62,054
Whisky, Scotch, Mackenzie Bros.	61,994
Wine, J. F. O'Toole	62,045
Wine, port, Offley, Forrester & Co.	62,026
Wines, I. L. Lamm Co.	62,070
Wrenches, Robbins, Gamwell & Co.	62,121

LABELS.

"Arcadia Rose," for soap, Armour & Co.	13,476
"Arcadia Sandalwood," for soap, Armour & Co.	13,475
"Artgum The Dry Cleaner and Massager," for a cleaning composition, A. Sommer	13,480
"Barne's Croup Grease," for a remedy for croup, National Chemical Co.	13,483
"Caumalt," for whisky, Hazeltine & Perkins Drug Co.	13,474
"Daisy Bread," for bread, Charles Seip Baking Co.	13,469
"Dextrose," for a prepared food for infants and invalids, Dextrose Food Co.	13,472
"Ginger Cake Molasses," for molasses, Berry, Maybrun Co.	13,470
"Karlen's Keystone Scalp Massage and Shampoo," for a scalp preparation, Karlen Mfg. Co.	13,478
"Kleeneen," for a fluid for the removal of grease stains and spots, S. S. Walstrum.	13,481
"Louvre Glanz," for liquid for finishing, restoring, and preventing the cracking of oil paintings, L. Mendel	13,482
"Phar-O.," for embalming fluid, Slifer Chemical Co.	13,484
"Pioneer," for lager beer, John Gund Brewing Co.	13,473
"Root Juice," for a medical preparation, W. B. Cabler	13,477
"Security Gall Salve," for a gall salve, F. B. Dunnie	13,479
"Uncle Ben Molasses," for molasses, Berry, Maybrun Co.	13,471

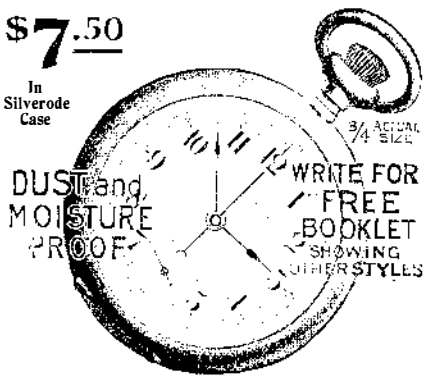
PRINTS.

"Burton-Pierce Uniforms," for uniforms, Burton-Pierce Co.	1,958
"F. T. Birksen's Incubator," for incubators, F. T. Birksen	1,963
"Mapl-Flake Hobby Horse," for a prepared cereal breakfast food, Hygienic Food Co.	1,962
"Men's and Boys' Apparel," for men's and boys' apparel, H. C. Lytton	1,959
"Nachtwachter," for beer, Chas. W. Shonk Co.	1,960
"The Fleur of the Hour," for flour, L. P. Hubbard	1,961

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

$7.50 In Silverode Case



STRONG & DURABLE

The New York Standard
CHRONOGRAPH
IS THE ONLY
"Stop-Watch" Watch

made in America and is unequaled for Laboratorial and Experimental Work, Photographic Purposes, Electric and Telephone Uses. For Refiner and Compounders of Oils, etc. For Physicians, Surgeons, Nurses, and for the exact timing of all athletic events.

All Jewelers Sell Them

New York Standard Watch Co., 401 Communipaw Ave., Jersey City, N. J.

SEALED PROPOSALS.

PROPOSALS will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock A. M., May 7, 1907, and publicly opened immediately thereafter, to furnish at the navy yard, New York, N. Y., two sets wireless telegraph apparatus and two duplicate gas engine generating sets. Applications for proposals should refer to Schedule 644. Blank proposals will be furnished upon application to the navy pay office, New York, N. Y., or to the Bureau. E. B. ROGERS, Paymaster-General U. S. N. 4-10-07.

College Men Wanted

Profitable Summer Work. Permanent Employment If You Want It

WE want an energetic man or woman in every county to handle an extraordinary new book proposition. Nothing like it for big sales and big commissions. Write at once to

THE REVIEW OF REVIEWS COMPANY
13 Astor Place, Room 414, New York

LET US BE YOUR FACTORY
WRITE FOR ESTIMATE ON ANY ARTICLE YOU WANT MANUFACTURED
STAMPINGS, MODELS, EXPER. WORK
WRITE FOR FREE BOOKLET
THE GLOBE MACHINE & STAMPING CO.
970 Hamilton St., Cleveland, O.

Corliss Engines, Brewers and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD. 24 Frankfort Street. New York.

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & CO., 228-229 South Street, New York

MODELS & GEARS INVENTIONS PERFECTED UNION MODEL WORKS 103 So. CLARK St. CHICAGO.

MODELS & EXPERIMENTAL MACHINERY. Gears, Dies, Tools. Novelties manufactured. Fine, Accurate Work a Specialty. M. P. Schell, 1759 Union Street, San Francisco.

VENTRILOQUISM

Learned by any Man or Boy at home. Small cost. Send to-day 2-cent stamp for particulars and proof.
O. A. Smith, Room 318, 2040 Knoxville Ave., Peoria, Ill.

ELECTRONS AND THE ELECTRONIC Theory are discussed by SIR OLIVER LODGE in SCIENTIFIC AMERICAN SUPPLEMENTS 1428, 1429, 1430, 1431, 1432, 1433, 1434. Price 10 cents each, by mail. Munn & Company, 361 Broadway, New York City, and all newsdealers.

NAME PLATES—STEEL STAMPS
EMPLOYEE CHECKS, KEY TAGS & BADGES.
J. ROBBINS MFG. CO. 58 KNEELAND ST.
SEND FOR CATALOGUE BOSTON, MASS.

INVENTORS' OPPORTUNITY

JAMESTOWN EXPOSITION will admit models, plans, inventions, etc., to be displayed and operated and sold. A *special opportunity* not previously granted at other expositions. *Awards*—Gold, Silver, and Bronze Medals and Diplomas. Exhibits delayed will be received after Opening Day. For details, cost, arrangements, etc., Address

BUREAU OF INVENTIONS
JAMESTOWN EXPOSITION
NORFOLK, VIRGINIA

Before You Invest

A dollar in anything get my book "How to Judge Investments." It tells you all about everything you should know before making any kind of an investment, either for a large or small amount. This book gives the soundest advice and may save you many dollars. Send two-cent stamp for a copy; do it now.

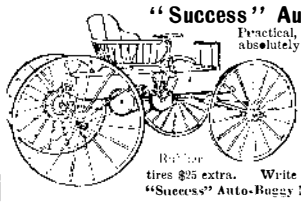
Send your name and address and get the Investors' Review for

3 Months Free

This will keep you reliably posted on various kinds of investments. Address

Editor INVESTORS' REVIEW, 1382 Gaff Bldg., CHICAGO, ILL.

"Success" Automobile, $250



Practical, durable, economical and absolutely safe. A light, strong, steel-tired Auto buggy. Suitable for city or country use. Speed from 4 to 20 miles an hour. Our 1907 Model has an extra powerful engine, patent ball-bearing wheels; price, $275. Also 10 h. p. $400. Rubber tires $25 extra. Write for descriptive literature.

"Success" Auto-Buggy Mfg. Co., St. Louis, Mo.

WELL DRILLING Machines

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.

WILLIAMS BROS., Ithaca, N. Y.

"Bristol" STEEL RODS

Ruled with A Rod of Steel—

"Bristol" Steel—the gamest fish submit.

"BRISTOL" Rods are light, pliant, graceful; yet strong and dependable. The standard steel rod—the original steel rod.

Twenty years of rod-building experience enter into "BRISTOL" products.

A significant feature of interest to fishermen is our THREE YEAR GUARANTEE.

Look for our trade-mark "BRISTOL" stamped on the reel seat; all others are imitations.

Catalog, with illustration of Rods for all uses, free on request.

THE HORTON MFG. CO.
58 Horton Street Bristol, Conn., U. S. A.

How to Make a 100-mile Wireless Telegraph Outfit

In the following SCIENTIFIC AMERICAN SUPPLEMENTS, the well-known wireless telegraph expert, Mr. A. Frederick Collins, describes clearly and simply, without the aid of mathematics, the construction of a 100-mile wireless telegraph outfit. Complete drawings accompany his descriptions.

The design and construction of a 100-mile wireless telegraph set is described in SCIENTIFIC AMERICAN SUPPLEMENT 1605.

The location and erection of a 100-mile wireless telegraph station is described in SCIENTIFIC AMERICAN SUPPLEMENT 1622.

In SCIENTIFIC AMERICAN SUPPLEMENT 1623, the installation and adjustment of a 100-mile wireless telegraph station is fully explained.

The adjustment and tuning of a 100-mile wireless telegraph outfit is discussed in SCIENTIFIC AMERICAN SUPPLEMENT 1624.

The theory and action of a 100-mile wireless telegraph outfit is explained in SCIENTIFIC AMERICAN SUPPLEMENT 1625.

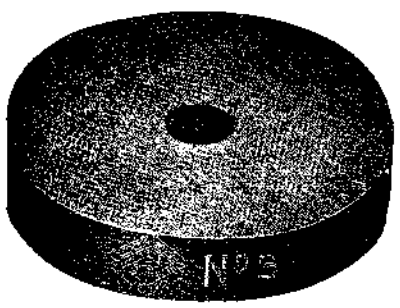
The management and operation of ship and shore stations is clearly set forth in SCIENTIFIC AMERICAN SUPPLEMENT 1628.

These six articles constitute a splendid treatise on the construction, operation and theory of wireless telegraph instruments. The complete set will be mailed to any address for 60 cents.

Single numbers will be mailed for 10 cents

Order from your newsdealer, or from

MUNN & CO., 361 Broadway, New York, N. Y.



Rubber Pump Valves

For Cold and Hot Water, Oils, Acids, High Pressure Mine Service and for every pumping requirement.

Mechanical Rubber Goods of every description of unsurpassed qualities, including BELTING, HOSE PACKINGS, Gaskets, Mats and Matting, Tubings, Springs, Interlocking Tiling, Emery Wheels and MOULDED and CUT SPECIALTIES for any mechanical and commercial device.

NEW YORK BELTING & PACKING COMPANY, Ltd.
91 & 93 Chambers Street, New York

CHARTER

Stationaries, Portables, Hoisters, Pumpers, Sawing and Boat Outfits, Combined with Dynamos.
Gasoline. Gas. Kerosene.
Send for Catalogue.
State Power Needs.
CHARTER GAS ENGINE CO., Box 148, STERLING, ILL.

Scales All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made. Also 1000 useful articles, including Safes, Sewing Machines, Bicycles, Tools, etc. save Money. Lists Free. CHICAGO SCALE CO., Chicago, Ill.

LEARN TO BE A WATCHMAKER

Bradley Polytechnic Institute
Horological Department
Peoria, Illinois
Formerly Parsons Horological Inst.
Largest and Best Watch School in America
We teach Watch Work, Jewelry, Engraving, Clock Work, Optics. Tuition reasonable. Board and rooms near school at moderate rates. Send for Catalog of Information.

WM. H. BRISTOL
Electric Pyrometers

Portable or Recording Forms. All ranges to 2900° F. Practical, Accurate. Inexpensive. Guaranteed to give satisfaction. Send for circulars.
Wm. H. Bristol, 45 Vesey St., New York

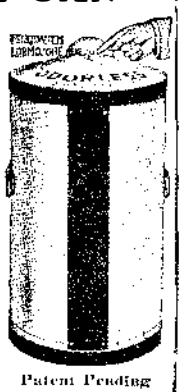
FORMOZONE "ODORLESS" GARBAGE CAN

Made of heavy galvanized iron, air and water tight, two steel shields, steel bound top and bottom, tight fitting cover, rivetted and soldered throughout. Odorless, Practical, Sanitary. Costs very little more than the ordinary garbage can. Used in connection with Formozone, averts nauseating odors, dispels the germ-carrying fly.

The Only Antiseptic Garbage Can Made.

We also manufacture the Formozone "Odorless" Garbage Pail.

Send for full details and Price List.



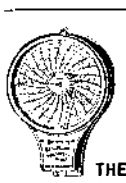
Patent Pending

FORMOZONE HYGIENIC MFG. CO.
East Madison St., CHICAGO

Bausch & Lomb
Fine Balances

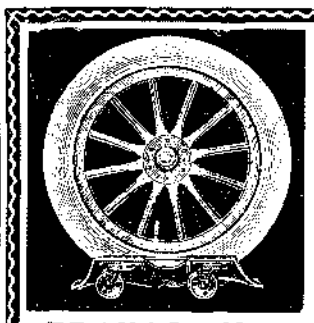
Our line of Analytical Balances is very comprehensive, including all the leading makes. We can supply balances at all prices; also druggists' and other small balances from $35 up. This is only a part of our great line of laboratory apparatus. Write for prices and catalogs.

Bausch & Lomb Optical Co.
Rochester, N. Y.
NEW YORK BOSTON WASHINGTON
CHICAGO SAN FRANCISCO



BRISTOL'S
Recording Instruments

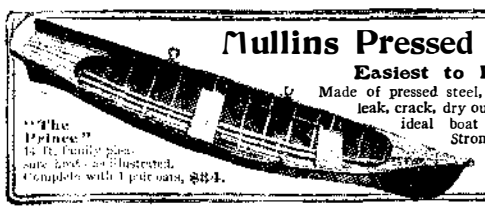
For Pressure, Temperature and Electricity in all ranges
INSURE SAFE & ECONOMICAL OPERATION
Write for Catalog T. stating conditions
THE BRISTOL CO., Waterbury, Conn., U.S.A.
New York, 114 Liberty Street Chicago, 752 Monadnock Building



Franco-Auto Portable TURNTABLE

No. 2 Ball Bearing Caster, made in one piece, light and durable. Cars can be run off or on at either end. Protects Tires when car not in use. One man can handle the largest car with ease. Indispensable for handling cars in garage, factory or private barns. Requires no jack to place in position. Write for full description and price list.

FRANCO-AMERICAN AUTO & SUPPLY COMPANY
1402 Michigan Avenue, CHICAGO



Mullins Pressed Steel Boats Can't Sink

Easiest to Row—Absolutely Safe

Made of pressed steel, with air chambers in each end like a life boat. Can't leak, crack, dry out or sink—last a lifetime. Every boat guaranteed. The ideal boat for families—summer resorts—parks—boat liveries. Strong, safe, speedy. Write for our Catalogue of Row Boats, MotorBoats, Hunting and Fishing Boats.
The W. H. Mullins Co., 118 Franklin St., Salem, O.

THE PERFECT PULVERIZER

For Cement Rock and Clinker, Coal, Phosphate Rock, and other refractory substances.

Nothing Succeeds Like Success

Over **2000 "Griffin Mills"** sold to date. **783** of these sold to the following six leading Cement Companies of the United States:

American Cement Company
Alpha Portland Cement Company
Lehigh Portland Cement Company
Iola Portland Cement Company
Vulcanite Portland Cement Company
Hunt Engineering Company

Orders on books April 1st for 1907 shipment, **229 Mills.**

MANUFACTURED ONLY BY
BRADLEY PULVERIZER CO., 92 State Street, BOSTON

London Office
37 Walbrook,
E. C.

Berlin Office
60 Friedrich
Strasse

THE GRIFFIN MILL

BUILD WITH PRACTICAL KNOWLEDGE

If you are a House-Owner or *planning to build*, this set of books will save you many times its cost. For the young man no better chance to learn a paying trade or profession could be offered. If you are a Carpenter, Contractor, Builder, Architect, Draftsman or Mechanic it offers you an exceptional chance to advance in your present occupation. The truest test of your present efficiency is the amount of money earned by you from week to week. Unless you are advancing and earning ***more and more*** money as you grow older, there must come a time when younger and more ambitious men will crowd you out. Learn now to turn your spare time into money.

Cyclopedia of Architecture, Carpentry and Building

Compiled from representative instruction papers of American School of Correspondence. This offer is made merely to advertise the School. We believe this great work will easily demonstrate the superiority of our method of instruction. If you mention this Magazine, a 200-page hand-book describing the School's 60 regular courses will be sent FREE.

SPECIAL ADVANCE SALE
LESS THAN 1-3 REGULAR PRICE
IMMEDIATE DELIVERY

TEN MASSIVE VOLUMES, each nearly one foot high. Bound in red half morocco. Over 4,000 pages; 3,000 illustrations, full page plates, plans, sections, etc. Printed on highest grade paper; entirely new type—DE LUXE books in every particular.

Special $19.80 Price
Regular Price $60

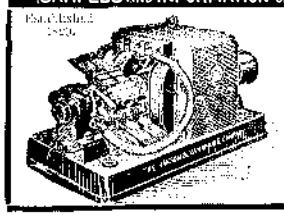
Sent by prepaid express. Send $2 within five days, and $2 a month if satisfactory; otherwise notify us to send for them. In any case you lose nothing.

Absolutely no orders accepted at this price if postmarked later than May 25, 1907.

Among the Chapters: Reinforced Concrete Construction—Carpentry—The Steel Square—Building Law—Fireproofing—Stair Building—Superintendence—Estimating—Contracts—Specifications—Strength of Materials—Architectural Drawing—Masonry—Electric Wiring—Plumbing—Steam Fitting—Heating—Ventilating—Cornice Work—Skylight Work—Roofing—Steel Construction.

AMERICAN SCHOOL of CORRESPONDENCE, CHICAGO

COLD GALVANIZING.
AMERICAN PROCESS. NO ROYALTIES.
SAMPLES AND INFORMATION ON APPLICATION.



NICKEL AND Electro-Plating

Apparatus and Material.
THE Hanson & VanWinkle Co.,
Newark, N. J.
28 & 30 S. Canal St. Chicago.

THE BEST LIGHT

Brighter than electricity or acetylene—cheaper than Kerosene—makes and burns its own gas.
No GREASE, DIRT, SMOKE or ODOR.
A safe, powerful, white, steady light—durable and handsome. Over 100 styles—every lamp warranted.
AGENTS WANTED EVERYWHERE.
THE BEST LIGHT CO., 87 E. 5th St., Canton, O.
Owners of Original Patents.

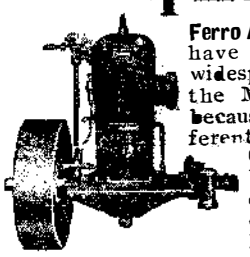
"EXER-KETCH" IRON AUTO

Mechanically perfect and guaranteed.

Patented

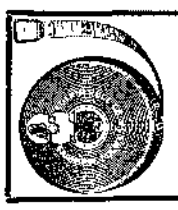
Adjustable in size to fit any boy or girl as they grow from 4 years to 14 years. "Geared" for fastest speed, but runs easier. Stronger (it's iron) but lighter weight. Rider has absolute control riding forward or backward, coasting or climbing a hill. "Can't upset." No dead center. "CAN'T BE BROKEN and won't wear out." A straight pull (ordinary hand-movement), instantly interchangeable to the exact "Rowing and Sculling" exercise motion. *Designed by a Physician* to develop and strengthen the *spine* and *chest*, and *rest* the child's legs. Write for our free offer. It tells you how to get an "Exer-Ketch" Iron Auto Free.
"Exer-Ketch" Novelty Co., 106 N. Senate Av., Indianapolis, Ind.

DO YOU KNOW THE FERRO?



Ferro Auto-Marine Engines have been creating a widespread interest at the Motor Boat Shows because they are so different from all others. Catalog tells why. Write for it to-day or send 10 cents for our Treatise on Marine Engines.

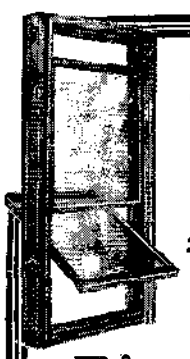
THE FERRO MACHINE & FOUNDRY CO.
75 Wade Building, Cleveland, O.
Large Stock at 75 Cortlandt Street, New York, N. Y.



LUFKIN
TAPES AND RULES
ARE THE BEST.
For sale everywhere. Send for Catalog No. 16.
LUFKIN RULE CO.
Saginaw, Mich., U. S. A.
New York and London.

A MONEY MAKER

Hollow Concrete Building Blocks Best. Fastest. Simplest, Cheapest Machine. Fully guaranteed.
THE PETTYJOHN CO.
615 N. 6th Street, Terre Haute, Ind.



Proved Best BY Every Test

Mullins Fireproof Window

is absolutely fireproof and actually does what no other window can do—it stands every test.

Ask for an Estimate
or write for our convincing catalogue.

THE W. H. MULLINS CO.
203 Franklin Street, Salem, O.

We also make everything in architectural sheet metal work—stairway, skylights, wrought iron grilles, cornices, etc. 120-page catalogue of stock designs on request.

HELMET OIL LUBRICATES ANYTHING.

IF YOU HAVE A HOT BOX TRY IT. C. H. BESLY & CO. CHICAGO-ILL-U.S.A.
15 to 21 South Clinton Street.